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VOL. XIX. No. 12

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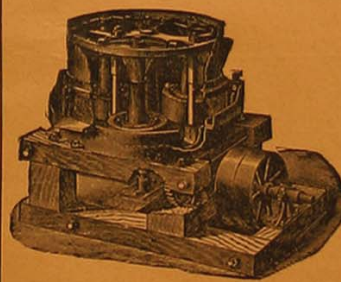


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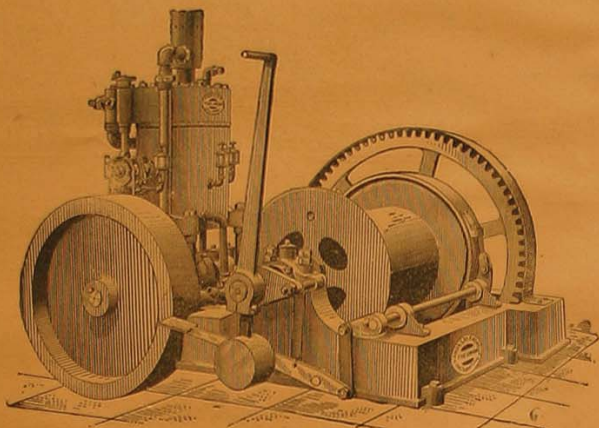
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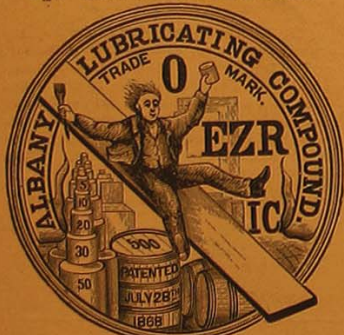
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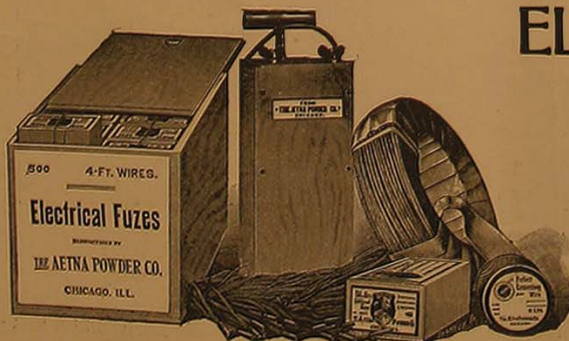
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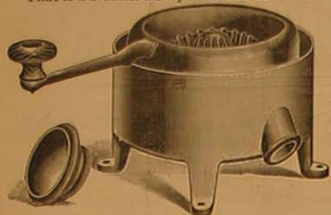
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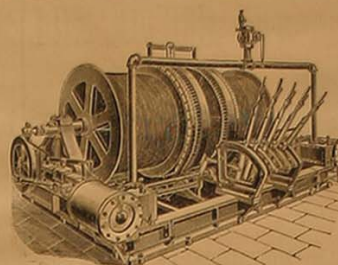


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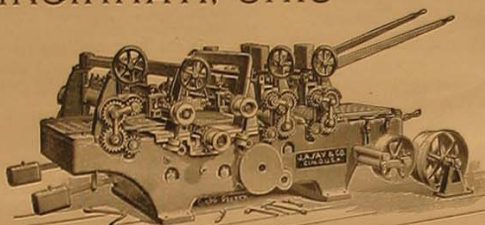
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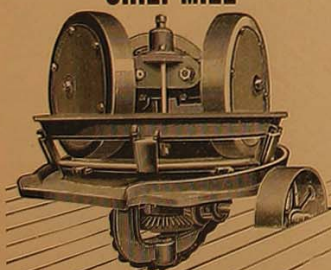
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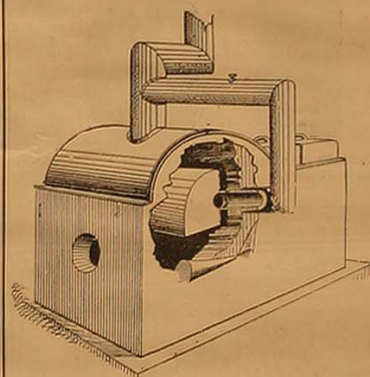
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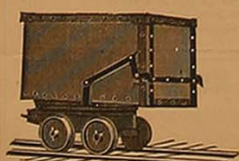
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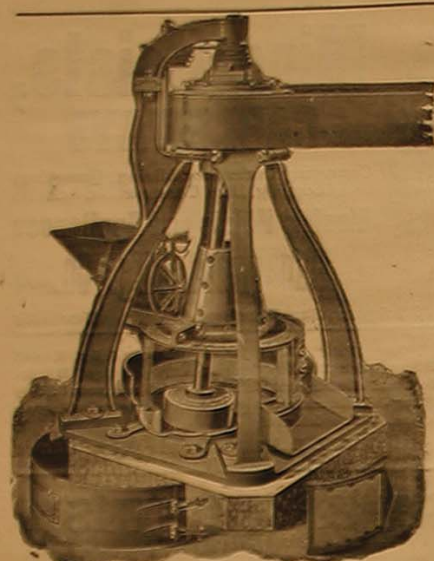
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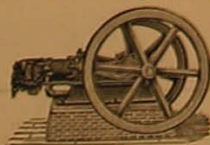
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## MARKING MINERAL SPECIMENS.

In reviewing the ore collections at the Trans Mississippi and International Exposition, at Omaha, Dr. Wm. B. Phillips has cause to remark as to the proper marking and labeling of the specimens as follows:—

"The value of an exposition of this kind depends upon the lucidness of the information offered. A dozen typical specimens, properly mounted, installed and labeled, even should they be of small size, are worth more than huge blocks of ore with not a single adequate label in the lot. The lack of proper labeling is a conspicuous feature of the Mines Building, and one that will cause the Jury of Awards a great deal of unnecessary trouble, if it be not remedied. It may be said as to some of the exhibits that they were thrown open to the public before they were ready, and work which should have been done before any visitors were allowed to enter is still in progress."

Mineral specimens or ores in a public or private collection ought to be marked with the catalogue numbers with black paint for white or light-colored minerals, and with white paint for black or dark-colored specimens. When the catalogue number is painted on a flat surface of the specimen, its identity is safe, as packing and unpacking is sure to cause confusion and loss of labels, if separate from the specimen or on tags or cards. In large specimens such marking with paint ought to be done on two sides of the specimen, in case of being rubbed or defaced. The best material to use for ticketing or labeling is a piece of rather strong glass, say 3 by 4 or 4 by 6 inches, according to the size of specimen and information required to be painted on the glass with black paint. Glass is better than cards for this purpose on account of its transparency and weight. The catalogue number of the specimen should be painted on one corner of the piece of glass. With this system of marking, specimens and labels can be packed separate, and the work of marking is not destroyed by heavy specimens defacing the label. The value of a mineral specimen depends as much on locality as on the economic or scientific interest of the specimen without knowledge of its locality, hence the great importance of properly marking minerals in both public and private collections. The value of many a fine private collection is lost to relatives of the owner after his decease, from this cause of not having the specimens in the collection marked and a complete catalogue made.

In the physical laboratories of Europe and America, recent experiments have revealed some of the features and possibilities which result from the operation of a secret process, by which atmospheric air is made to produce the air in a closed vessel in the liquid form. It is claimed that this can be done easily and cheaply with proper machinery. If that statement be true, the time may not be far distant when it will play an important part in deep mining operations, and in mining in tropical countries. Every miner who has had any experience with air compressing and air drills knows that the first compression of air produces heat, and that the liberation of compressed air, or consequent expansion of it, produces cold, even below the freezing point.

Charles E. Tripler tells, in the June *Cosmopolitan*, of his wonderful discovery of liquid air.

“Liquid air is simply air such as we breathe, from which most of the heat, originally derived from the sun, has been extracted. As a result, some fifteen minutes after the process is started, a clear frosty-looking liquid begins to pour down from a tube about an inch in diameter, and speedily fills the receptacle placed beneath to receive it. This rate of production can be maintained all day if desired. Each cubic foot of liquid represents nearly eight hundred cubic feet of ordinary air, and in its expansion, as it returns to its gaseous state lies a power of the highest efficiency, easy to control, ready to be harnessed and utilized. Its temperature is about three hundred and twelve degrees below zero, Fahrenheit.

In this more quiet state, it has the appearance of pure water, except that it shows a pale-blue tint, which intensifies as the evaporation proceeds. There are, in fact, two entirely distinct fluids present—liquefied nitrogen and liquefied oxygen. It is to the latter that the blue tint is due, nitrogen being absolutely limpid. \* \* \*

To show the explosive power of this mysterious liquid under various conditions, Mr. Tripler says: "I first take a heavy copper tube about a foot long, sealed at the lower end, and having poured in a few drops of liquid air, hammer a closely fitting wood plug into the orifice. I have scarcely time to step back before the expanding vapor blows out the plug with a loud explosion, driving it against the ceiling with great force; in the open air I have seen it hurled to a height of three hundred feet. The confined liquid has behaved exactly as water would act in a tube heated white hot.

Here the action is purely mechanical, but by taking advantage of the intense chemical activity of oxygen, explosions of far greater violence may be obtained. To illustrate this, I saturate in the azure-tinted liquid a wad of oily cotton waste, and place it in a steel tube of great strength, open at both ends. When a spark is applied—which must be done from a safe distance—the tube is rent in fragments. If the wad were first wet with turpentine, the explosive force would exceed that of gun cotton."

The most interesting application of liquid air which has hitherto been tried on a commercial scale, is to make an explosive by mixing it with carbon. So said Professor Ewing, in a paper read before the London Society of Arts on March 2. When the liquid air, enriched by a large part of its nitrogen, is mixed with powdered charcoal, it forms an explosive comparable in power to

dynamite, and which, like dynamite, can be made to go off violently by using a detonator. To make the explosive, the liquid, containing about 40 or 50 per cent of oxygen, is poured on fragments of wood charcoal, two to four cubic millimeters in size. These are kept from scattering under the ebullition of the liquid by mixing them into a sort of sponge with about one-third of their weight of cotton wool. The liquid which remains is, of course, richer in oxygen than that which is originally applied, and when the mixture is allowed to stand long, all the liquid evaporates and the explosive power disappears. It must, therefore, be mixed at or near the place where it is to be used. But the cotton wadding, impregnated with coarse charcoal powder, can take up more than enough of the liquid to supply oxygen for its complete combustion, and when put quickly into thick insulating cases of paper, it retains its full explosive power for five or ten minutes. After an interval, which ranges from fifteen to thirty minutes, according to the size of the cartridge, all explosive power is lost. Experiments were made with this explosive on the parade ground at Munich, and a practical test on a large scale has gone on for some months in a coal mine in Pensburg, not far from Munich, and are claimed to have given very satisfactory results. The chief advantage of the explosive is its cheapness, the cost being simply that of the power used in liquefying the air. Even the fact that after a short time the mixture ceases to be capable of exploding may be urged as a recommendation in one respect, for if a detonator hangs fire there is no danger of the charge going off accidentally sometime after the explosion is due; nor is there any danger of its being purloined or used for criminal purposes. It is questionable, however, if such an unstable explosive can ever be found either convenient or economical, except, perhaps, in large quarries where a large amount of blasting is to be done at one place.

In the hot parts of the lower levels on the Comstock Lode, liquid air may in future be found more economically convenient than the use of ice. The same may be said of the mine workings and railway cars, both for passengers and fruit which have to be transported through the hot desert climate where the temperature reaches 126 degrees in the shade for days at the hot season, which generally lasts from July to September.

## MARKETING THE PRODUCT OF A GOLD MINE.

Gold mining, compared with the mining of other metals is unique in several respects, and for the same reason it possesses a greater attraction for the investment of capital than other branches of the industry. Being the highest standard of value, its price does not fall like other trade commodities, but an increased demand has the effect of causing it to rapidly appreciate in value above the standard price. As the market is always ready to absorb any amount produced, no difficulty is experienced in finding a purchaser. The gold miner never has to contend with an overstocked or dull market, as he can exchange the refined product of his mine for coin in the shortest time possible that it takes to effect a trade or sale between parties. The ease with which the product of either a large or small gold mine can be transported to market, no matter how rough or inaccessible the road or country through which it has to be



transported may be, also tends to make gold mining a most desirable occupation. The expense compared with the sale of all other minerals, effects a saving to the gold miner which no other producer enjoys. No troublesome freighting by teams or railway freight rates have to be considered in marketing the product of gold mines. These are some of the reasons why gold mining at the present time has received more than ordinary attention from capital.

The increased demand for gold, as compared with that of silver as a medium of exchange, has appreciated the value of gold as compared with the present value of all other products of labor, which have depreciated in value. Gold mining, for these reasons, is the most aristocratic branch of the mining industry, when the important question of ore supply does not tax the ability of the mine manager, hence the present demand for large low-grade mining properties.

### THE PROFESSIONAL CLAIM LOCATOR.

The California State Mining Law, of 27th March, 1897, has had the effect it was desired to accomplish—in making it incumbent on the locator of a mining claim to perform \$50 worth of work on each claim located after that date, within sixty days. All claims under the old Federal law which were located between 1st January, 1897, and 26th of March of the same year, have until 31st December next in which to perform the required \$100 assessment, to hold a claim located during that period, or before the passage of the state law already mentioned. As a result of this, the industry of the professional claim locator of old has to be exerted to his utmost to perform the required labor, if it has not already been performed. Three months and a half, with the fall stormy weather coming on, are now left for him to perform his duty. The result will be that the 1st of January next promises to close out his business of claim locating from year to year, without performing the necessary labor required by law.

The amount of mineral territory held in this way, which will soon be open for relocation, is of such an extent in many districts in each mining county of the state, that prospecting chances will be thrown open to the industrious and willing worker, which have for years been monopolized under the doing-nothing policy of the parasite which lived on the back of the mining industry of this state, whose occupation will soon be lost, and it is to be hoped never to return.

### NEW FACTOR IN MONETARY AFFAIRS.

The volume of the circulating medium of a country should be regulated in a measure by the volume of domestic commerce. International commerce cuts no figure, as balances in it are adjusted through the use of a commodity whose value is arbitrarily fixed upon weight and fineness. Two countries, however, having an equal volume of trade need not necessarily have the same volume of money. The activity with which it can be employed very much modifies the quantum necessary.

The United Kingdom, for instance, could be dumped into California and would not fill it, yet that country has 38,000,000 people, while California has but 1,500,000. In consequence of the greater activity of circulation in the United Kingdom, a very much less volume of money will perform the work there

in a certain volume of trade than in California; so, in a city, a dollar may be made to pay twenty debts, or perform service in twenty transactions a day, while it would pay but one debt, or could be used in but a single transaction in the same period in the country. The United States is very large territorially, and population is comparatively sparse.

We have already acquired Hawaii, Porto Rico, Cuba, and the Philippine Islands—the latter, in whole or in part, are destined to be a part of the nation. Heretofore, their trade with us has been foreign, now it will become domestic; our money will be their money, and as their trade will increase our volume of domestic commerce to the extent of hundreds of millions of dollars, and their situation is such that there cannot be great activity of circulation, our volume of money will have to be materially enlarged. It will be as necessary for our government to supply them with an adequate volume of money as to provide free institutions, and a free government capable of preserving peace and order, and of protecting life and property. It will be an equally high duty to stimulate industries that will develop their rich resources, and render them prosperous. To do this, it will be essential that our management shall be such as will assure them adequate financial facilities.

Enlarging, as their acquisition will, the markets for our home productions, such as breadstuffs, provisions and manufactures, there will be a greater demand for money at home. No branch of economics is as important as the money question, and statesmen and wise financiers will readily recognize it. The war has changed the current of American thought in regard to territorial expansion and external amplifications, and should have the same effect in regard to our monetary system. Expansion in one, suggests expansion in regard to the other. We are a growing nation in production, commerce and population, and it is essential that our money volume should keep pace with growth in other respects.

## CORRESPONDENCE

### CALIFORNIA.

#### Statistics of the Tuolumne County Mills, Given in Number of Stamps.

(From our Special Correspondent.)

It may be of interest to some of your readers to know the number of stamps that are actually found today in this county. To name each mine on which are found the mills, with their separate count, would take up too much space, hence, I have condensed the whole numerically as follows:

For 1897, 334 stamps were in operation, not all working continuously, but did actual work more or less during the above year, that produced by reduction of quartz into bullion—\$1,900,500 (different statements notwithstanding). The figures given are as nearly correct as possible.

For 1898, to August 15, there are, and have been 406 stamps employed—by next month this force will be increased by 24 stamps, now nearly completed—besides, there are to date 212 that are idle and not working. Furthermore, it is probable that some of these idle mills will be started up this year. I know of a 20-stamp mill now being put in working order, but, as the water supply has given out, steam or electricity or some other

power must be used till the rains come. The past two dry winters were unparalleled in the history of the country, but large retaining reservoirs are now being constructed, by the Tuolumne Water Company, high up in the Sierras. In the future, with a very moderate precipitation, will prevent any such calamity again occurring from drought of a similar nature that has befallen this mining section in the past two years.

The progressive condition of this country is marvellous—mines are opening up in every direction, in many instances extending back into a *terra incognita*, high up in the mountains of 5000 feet elevation, the prospects there found, warrants, development and expenditure in needed machinery, so that there are discovered mines now ready for mills, and the owners contemplate erecting stamp mills during this year both in upper and lower gold belts. Again, some companies propose to increase their present stamp power, so, from this source we shall gain, from direct information received, 172 stamps more, *i. e.*, new mills. Now the total number of stamps in the county is 952, with those to be added of 172, will give a total of 1124.

It is but fair to assume that the year 1899, with a generous water supply, and the now nearly completed mammoth electric-power plant, erected by the Tuolumne Water Company. All mills will have all the power they may need, hence, the output of the mines for 1899 will far exceed the product of 1897-98. The developments of so many mines now in active work, will require means to reduce this auriferous rock, hence, new mills must naturally follow, and many other later discoveries, not calculated in this sketch, now developing.

The old plan in mining was first to erect a mill before they had found a mine; today, it is the reverse—the mine must be found before the mill is erected.

Of chlorination plants there are five; the cyanide process, one only in active operation—several to be built before winter.

W. FRANK DRAKE, E. M.

SONORA, CALIFORNIA.

### Mojave Items.

(From our Special Correspondent.)

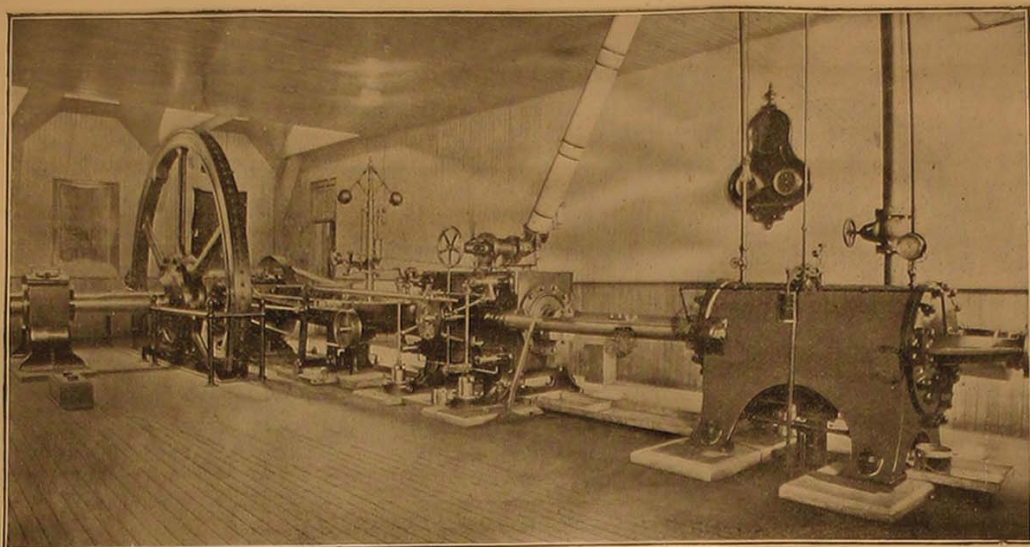
The mining interests in and around Mojave are constantly improving. The new cyanide dry crushing plant, which started up August 1st, is running full capacity all the time. It is the only mill within 30 miles of the Iowa that treats low grade base ores. The entire plant cost \$10,000.

Considerable excitement is lately made manifest by the first returns of a care load of ore sent to San Francisco from one of the newly opened mines in the lonely Butte, (Soledad Mountain) located 4 miles southwest of town. It netted the owner between six and seven hundred dollars. The chances are that another mining stampede will occur here similar to that of Randsburg before long.

The whole country round about here is rich in precious metals, but, owing to the heat and scarcity of water, very little has been done in the way of development.

A new cyanide plant of ten tons daily capacity is now under construction at the mill of Pridham & Quinn at Randsburg. The construction and general management of the plant is under the general supervision of Lew E. Aubury, M. E., the introducer of the first cyanide plants erected in the U. S.—all the material being furnished by Los Angeles firms. Mr. Aubury has also contracts on a number of other plants.





HALF DUPLEX CORLESS AIR COMPRESSOR AT HIGHLAND MINE, LEAD, SOUTH DAKOTA.

### THE WIDENING USE OF COMPRESSED AIR.

Until a few years ago the only general employment of compressed air was for sinking bridge caissons, operating rock drills and coal cutters and other mining machinery, manipulating air brakes, tunnel driving by the pneumatic process, with an occasional plant for raising acids, and one or two other minor uses. Today there are more than two hundred established applications of compressed air, exclusive of many patented processes in which it is employed, and the field is constantly widening.

In nearly all branches of industry the uses of compressed air are both numerous and unique.

Oil supply for oil burning engines can be regulated and oil barrels emptied by compressed air; elevators are operated, and when a railway locomotive is repaired, the steam and exhaust passages can be cleaned by a blast of air and the engine driven out of the shop by charging the boiler with compressed air.

In fact, it is almost impossible to keep abreast of the utilizations which enterprising master mechanics are finding for this power.

A method of elevating water by compressed air, of great value to mine work, consists of one or more metal chambers placed at the lowest point of the area to be drained. The water flows into the receptacle through a check-valve at the bottom, and when filled this check-valve closes and the compressed air is admitted, forcing the contents of the receptacle out through the discharge pipe. When emptied the air inlet valve closes, and the chamber refills with water. The action is entirely automatic and continuous. The advantages claimed for this pump, whose only piston-rod is a body of compressed air, are that it has no working parts requiring atten-

tion, operates without noise, shock, jar or the annoyance of exhausting steam, and that the compressor, which is the source of power, may be placed at any point most convenient to locate it, regardless of distance. High lifts are arranged in series, thus working at a low air pressure with minimum economy.

Chemical manufacturers find compressed air absolutely indispensable for moving acids which would ruin the valves of any pump, from tank cars and from one point to another in their works. Compressed air is also used in chemical works to agitate and cool solutions.

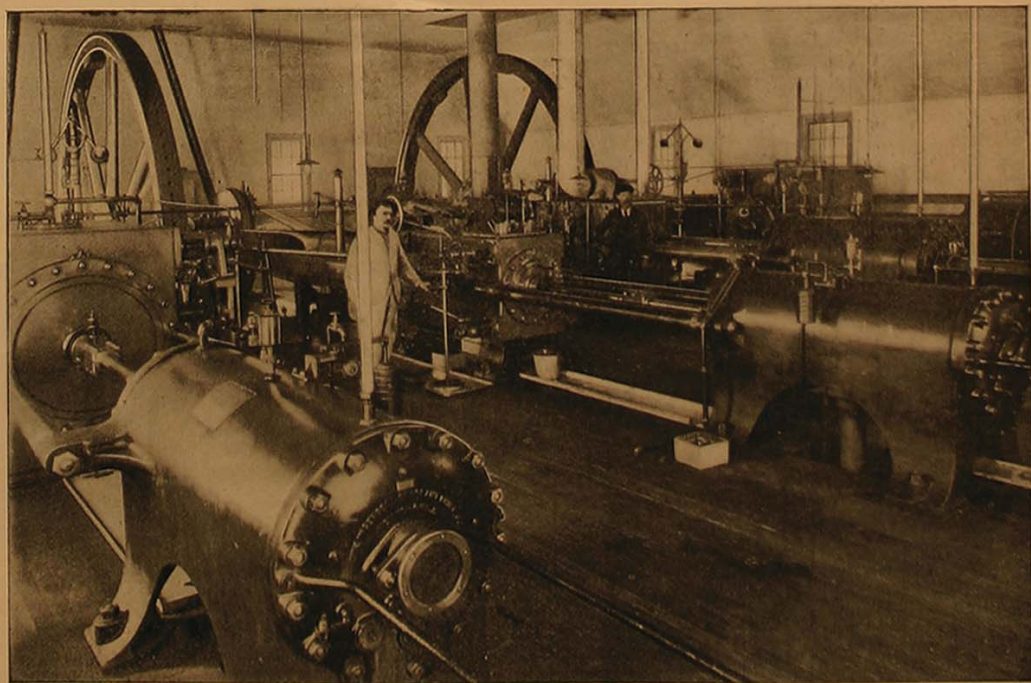
Asphalt for street paving is also refined by means of compressed air. The asphalt is boiled in vats for several days and during this process must be constantly agitated. This is

done by forcing compressed air through a system of pipes at the bottom of each vat, the asphalt at the conclusion of the process acquiring a consistency which admits of its being drawn off and cooled in barrels. The mixture of acids in the manufacture of nitroglycerine is also best accomplished by air pressure.

### EFFECT OF COMPOUNDING, COOLING, INTER-COOLING, AFTER-COOLING AND REHEATING.

Builders of air compressors and those who use compressed air will agree that the problem of heating or cooling air is a difficult one. Hot air in the cylinder of an air compressor means a reduction in the efficiency of the machine. The trouble is that there is not sufficient time during the stroke to cool thoroughly by any available means. Water-jacketing is the generally ac-

cepted practice, but it does not by any means effect thorough cooling. The air in the cylinder is so large in volume that but a fraction of its surface is brought in contact with the jacketed parts. Air is a bad conductor of heat and takes time to change its temperature. The piston while pushing air to the head rapidly drives it away from the jacketed surfaces so that little or no cooling takes place. This is especially true of large cylinders where the economy effected by water-jackets is considerably less than for small cylinders. Engineers who are shown indicator cards from large air compressors with pressure lines running away from the adiabatic, naturally regard them with suspicion and look for leaks past the piston or through the valves. Such leaks will explain many isothermal cards, and until



CROSS COMPOUND CONDENSING CORLESS AIR COMPRESSOR, AT THE ANACONDA COPPER MINES, BUTTE, MONTANA.

Steam Cylinders 24 and 44x48; Air Cylinders, 42½x48; Capacity, 3,180 cubic feet of free air per minute.

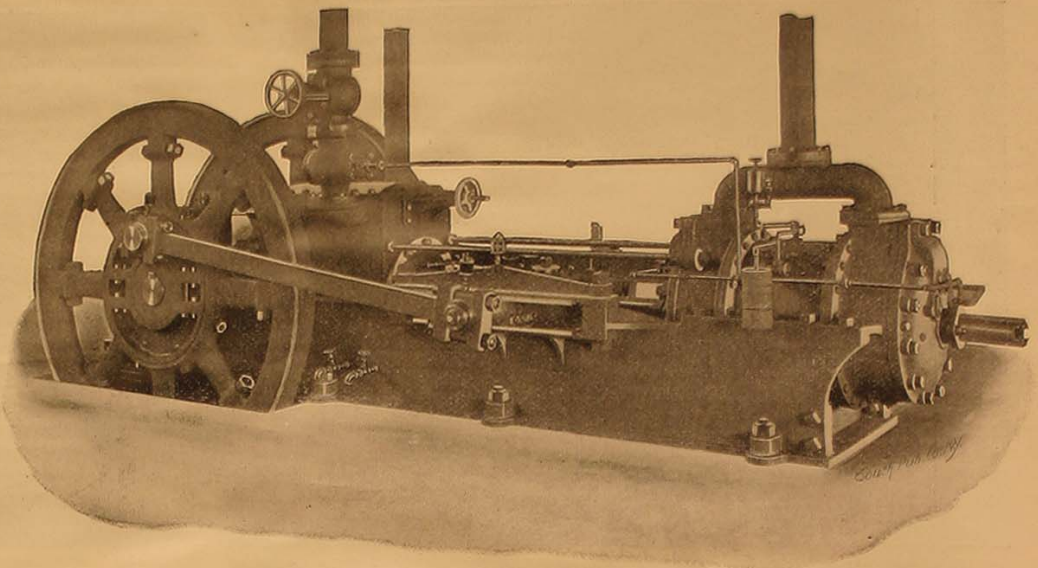


something better than a water-jacket is devised, it is well to seek economy in air compression through compounding.

The great advantage of compounding is the fact that more time is taken to compress a certain volume of air and that this air while being compressed is brought in contact with a larger percentage of jacketed surfaces.

The inter-cooler, which should always be used with compound machines, effect a larger saving by cooling and thereby causing the air to shrink in volume between the stages. The trouble with inter-coolers is that manufacturers are too prone to build them of cheap construction, economizing in machinery and in space, and loosing in thermic efficiency. A properly designed inter-cooler should reduce the temperature of the air back to the original point, that is to the temperature of the intake air. It can even do more than this, especially in winter when the water used in the inter-cooler is of low temperature. A simple coil of pipes submerged in water is not an effective inter-cooler because the air passes through the coil too rapidly to be cooled to the core, and such inter-coolers do not sufficiently split up the air to enable it to be cooled rapidly. This splitting up of air is an important point. A nest of tubes carrying water and arranged so that the air is forced between and around the tubes in an efficient form of inter-cooler. If the tubes are close enough together and are kept cold, the air must split up into thin sheets while passing through. Such devices are naturally expensive, but first cost is a small expense when compared with the efficiency of compressor, measured in the coal and water consumed.

Receiver inter-coolers are more efficient than those of the common type because the air is given more time to pass through the cooling stages and because of the freedom from wire drawing which may take place in inter-coolers of small volumetric capacity.



AIR COMPRESSOR FOR LIGHT TRANSPORTATION, BUILT FOR HERNANDEZ MENDIA AND CO., OF MAZATLAN, MEXICO.

After-coolers are in some installations as important as inter-coolers. An after-cooler serves to reduce the temperature of the air after the final compression. In doing this it serves as a drier, reducing the temperature of the air to the dew point, thus abstracting moisture before the air is started on its journey. In cold weather with air pipes laid over the ground an after-cooler may prevent accumulation of frost in the interior walls of the pipes, for where the hot compressed air is allowed to cool gradually the walls of the pipe in cold weather act like a surface condenser and moisture may be deposited on the inside for the same reason that we have frost on the inner side of a window pane. Another advantage of the after cooler is that it keeps the temperature of the line pipe uniform, otherwise this pipe will be hottest near the compressor, gradually cooling down and being thus subject to irregularities of expansion and contraction.

The following table will serve to illustrate

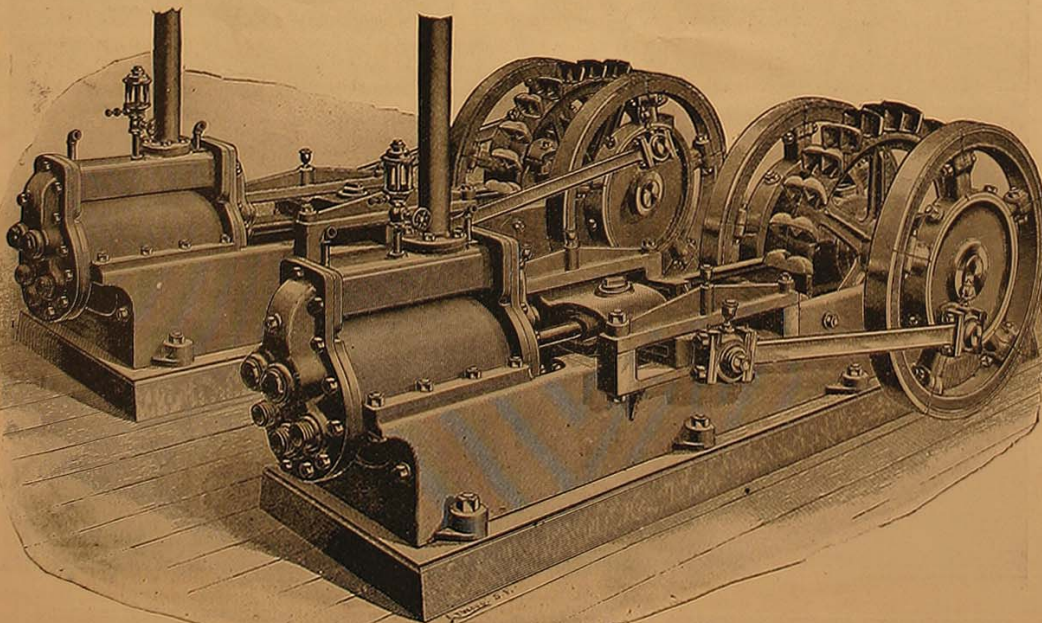
the large saving that is possible to effect by compounding. This table gives the percentage of work lost by the heat of compression, taking isothermal compression, or compression without heat, as a base.

Gage Pressures	One Stage N=1.408	Two Stage	Four stage
60	30.00 pr.ct.	13.38 pr.ct.	4.62 pr.ct.
80	34.00 "	15.12 "	5.04 "
100	38.00 "	17.10 "	8.00 "
200	52.35 "	23.20 "	9.01 "
400	68.60 "	29.70 "	12.40 "
600	83.75 "	32.65 "	15.06 "
800	90.00 "	35.80 "	16.74 "
1000	96.80 "	39.00 "	16.90 "
1200	106.15 "	40.00 "	17.45 "
1400	108.00 "	41.60 "	17.70 "
1600	110.00 "	42.90 "	18.40 "
1800	116.80 "	44.40 "	19.12 "
2000	121.70 "	44.60 "	20.00 "

Referring to the table, we learn that when air is compressed to 100 pounds pressure per square inch in a single stage compressor without cooling, the heat loss may be 38 per cent. This condition, of course, does not exist in practice, except, perhaps, at exceedingly high speeds, as there will be some absorption of heat by the exposed parts of the machine. It is safe, however, to say that in large air compressors that compress in a single stage up to 100 pounds gage pressure, the heat loss is thirty per cent. This, as shown in the table, may be cut down more than one-half by compounding or compressing in two stages, and with three stages this loss is brought down to eight per cent. theoretically, and perhaps to three or five per cent. in practice. As high pressures are used the gain by compounding is greater.

#### DETAILS OF INGERSOLL-SERGEANT AIR COMPRESSORS.

The frames are of the Girder type, made very strong, and provided with a centre support, with feet spread well apart, insuring great stiffness and



MESSRS. BACKUS & JOHNSON'S WATER DRIVEN COMPRESSOR ERECTED AT LIMA, PERU.



strength. Cylinders are made of best selected close-grained charcoal iron, mixed with selected scrap, and are of proper length and thickness for operating with 125 pounds steam pressure after having been re-bored once. The material is such that the wearing surfaces become polished after a few days' use, after which, with reasonably dry steam, the wear amounts to so little that the piston remains tight for an indefinite length of time. The cylinders are neatly lagged, and the space between lagging and cylinder packed with non-conducting material to prevent condensation as much as possible. The steam passages are short and direct, reducing clearance to the least possible amount. The cylinder is supported upon two pedestals with extended base, with ample bearing surface on the foundation. The vacuum dash pots are secured firmly to the sides of these pedestals. Strong lugs are provided for connecting the air cylinders tandem by means of suitable tie rods.

The shafts are of best wrought iron, of extra large diameter, and turned, key-seated and nicely finished. The bearings are polished to reduce friction to the lowest point.

The main pillow blocks are provided with removable shell boxes, with quarter boxes lined with genuine Babbitt metal, hammered and scraped to fit the shaft.

Approved means for taking up all lost motion is provided. The bearings are of ample length, and large oil boxes are provided with means for ready access to the shaft. The bearings run smoothly, cool and quiet under the heaviest loads.

The cranks are of the best selected charcoal iron, and of ample strength and proportion for the work to be done; they are of the disk pattern and the weight of the connecting rod and crank pin are counterbalanced on the opposite side, thus reducing end motion and vibration to the minimum. They are pressed on the shaft by hydraulic pressure, and securely keyed. The faces are planed and polished.

The fly-wheels are extra heavy, of square rim pattern, the faces and edges being turned practically true. The arms are of ample strength and well proportioned. The larger sizes are made in segments, accurately planed and fitted together with turned bolts in reamed holes. Rims of wheels are provided with starting bar holes.

The connecting rods are of forged steel with

strap, gib and key ends. The cross-head end is fitted with phosphor-bronze box and a crank end with a composition box lined with the best Babbitt metal, hammered, bored and scraped to fit the pin.

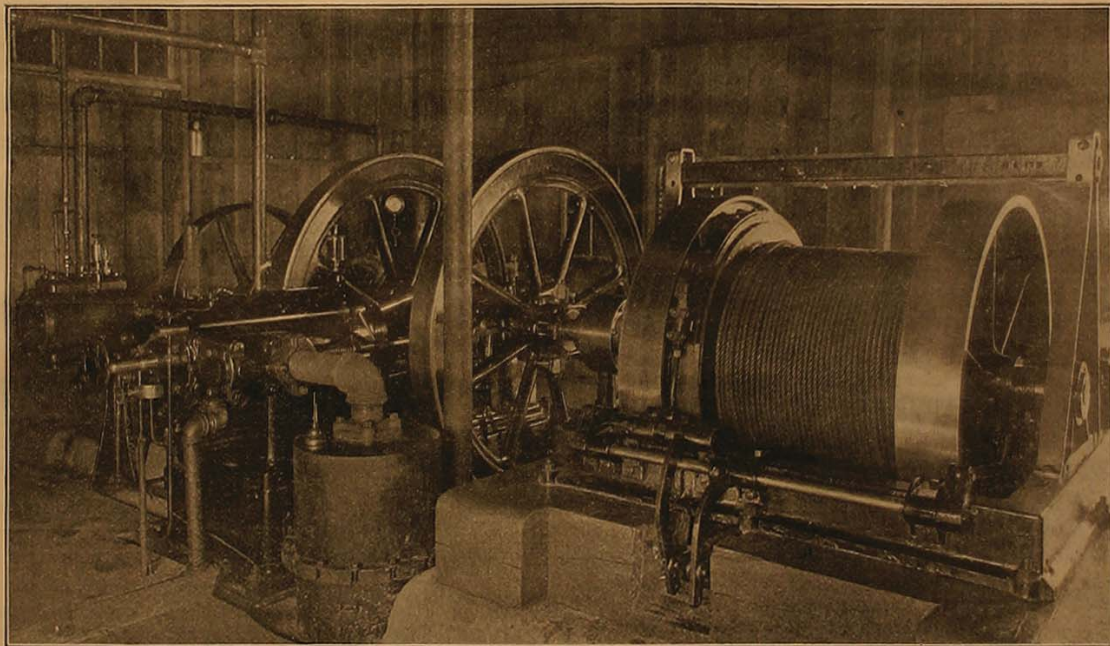
The cross heads are of the best crucible cast steel, provided with adjustable shoes for taking up all wear. The guides are V-shaped and scraped to a perfect surface. The shoes are lined with Babbitt metal, hammered and scraped to a perfect bearing in the slides. The cross-head pins are of forged steel, turned, polished and fitted to the cross-head by a double taper. They are easily removed and securely held in place with a nut or cap.

The valve gear is of the latest improved Corliss liberating type, fitted with vacuum dash pots. The connecting rods and pins are all of the best forged steel, and are fitted with phosphor-bronze bearings, adjustable for wear; provision for thorough lubrication is made, and the entire gear motion works smoothly and quietly. The catch blocks are of hardened steel.

into thin sheets; water circulates from the lower end and discharges through the tubes. The shell is steel and large enough for the proper filling of the high pressure cylinder, cranks being at right angles on duplex machines. A manhead, drain and low pressure pop safety valve are furnished. Contraction and expansion cannot cause leakage.

The whole nest of tubes are easily removed for cleaning, and not being common iron pipe, used by most makers, do not rust nor foul readily. This is the only pattern giving ample volume for the best results and the air is cooled to or below its original temperature, depending on the water used. It does not form an unsightly attachment to the compressor, as it may be located some distance away, in the basement, in a corner, overhead or in another room. It is an expensive type to build, but to get permanently economical results in compound compression it is essential that the design throughout should be the very best, combined with the largest possible area of cooling surface.

This arrangement offers a perfect means of aftercooling the air or gasses where it is not desired that the fluid enter the pipe systems above its original temperature. Used this way, whether with a compound or non-compound compressor, it is practically impossible for any moisture to pass into the pipe line as moisture will be precipitated by the cool tubes and may be



GASOLINE ENGINE MINING PLANT AT THE GOLDEN WAVE MINE, CONGRESS, ARIZONA.

The valves are oval shaped, slotted at one end to receive the Tee shaft heads of the valve stems, and are so constructed that any valve can be taken out without disturbing the valve stems or changing the adjustment of the valve gear. It is only a few minutes work to take all the valves out of the Corliss Engine and put them back again.

The governor is of the fly-ball type, provided with an automatic safety stop, and furnished with approved means for adjusting the speed by hand within the widest possible limits, without altering the throttle-valve.

The throttle valves are furnished with flanges and large hand wheels, nicely turned and finished. A brass drain pipe leading to the exhaust is provided.

In the Sergeant Vertical Receiver inter-cooler the air discharged by the intake or large cylinder passes downward on its way to the high pressure or compression cylinder. A large number of small finned brass tubes are set close together, dividing the stream of air

drawn off at intervals. Such use also prevents the flame passing to the mine or tainting the air, in case of an explosion, something which rarely occurs, but may in important cases be guarded against to advantage.

#### ANACONDA COMPANY'S AIR COMPRESSING PLANT.

The Ingersoll-Sergeant Drill Co. have furnished the Anaconda Company seven large Corliss Cross Compound Air Compressors; and two of their 30 1/4 in. x 60 in. Piston Inlet Air Cylinders to replace another make; also two 24 1/4 in. x 30 in. "Straight Line" Compressors and several of smaller sizes. The combined capacity of this plant being about 32,000 cubic feet of free air per minute. The air is used for rock drilling, pumping, etc., about 250 Ingersoll Sergeant Rock Drills being in use.

#### HIGHLAND MINE PLANT.

The Half Duplex Ingersoll-Sergeant Corliss Air Compressor installed at the Highland



mine, at Lead, South Dakota, has a steam cylinder, 20 inches in diameter. The air cylinder is 22 1/4 inches, and the stroke is 42 inches. Similar machines are used at the Daly-West mines at Park City, Utah; American Developing and Mining Company, Gibbonsville, Idaho; Basin and Bay State Mining Company, at Basin, Montana, and by W. J. Clark, of Neihart, Montana.

#### A MAZATLAN, MEXICO, PLANT.

The compressor built for Hernandez Mendia & Co., Mazatlan, Mexico, is a sectionalized, class A, compressor.

This construction admits of great strength and capacity in small space, inexpensive foundations, and easy transportation. Every part of the machine is very accessible, and the piston can be removed from cylinder in a short time, with ordinary tools, without disturbing the fly-wheels, shaft or valve connections, though it is seldom indeed that any attention is necessary, save an occasional oiling.

This type of compressor is well suited for general mining and tunneling work, where a machine is expected to stand the most severe usage, in regions remote from facilities for repair work, and its great capacity for hard and continuous service, together with its economy in steam consumption, has made it a deserved favorite for plants of a permanent character. Similar machines have been furnished to the Batopilas Mining Co., Batopilas, Mexico; Compania Minera de Panuca, State of Sinaloa, Mexico; El Zancuda mines, U. S. Colombia, S. A., and others.

#### PLANT ERECTED AT LIMA, PERU.

The illustration of the battery of straight line air compressors, driven by Pelton water wheels on the main shaft, was erected at Lima, Peru, S. A., for Messrs. Backus & Johnson, for a mine located in the heart of the Andes, and was made in sections for mule-back packing, no piece exceeding 300 pounds in weight.

The wheels are 4 feet in diameter and run under a head of 50 feet making 120 revolutions. Water is brought from a mountain stream through a line of 18 inch pipe and is applied to the wheels by double nozzles with 3 inch openings.

The air compressing cylinders are 10 inch in diameter by 18 inch stroke, and the wheels under this comparatively low head afford sufficient power to maintain a pressure of 70 lbs. at the receiver, at an elevation of 10,000 feet above sea level.

Ordinarily, the Pelton wheel can be made heavy enough so as to serve as a fly-wheel, but in the case above referred to, fly-wheels were made necessary from the fact that the water head was too low to admit of making the wheels large enough to carry the weight required for combined motor and fly-wheel and give the necessary speed to compressor.

#### GASOLINE ENGINE PLANT.

The plant operated by a gasoline engine erected at the Golden Wave mine, Congress, Arizona, is a very compact and convenient plant for a small mine. In it the use of belts and gearing is avoided and space saved. It is run by a gasoline engine, in a section where water is scarce. The engine is shown at the back of the engraving, and is rated a 30 H. P. It is connected directly to an air compressor and a hoist. The compressor is of the class "E," Ingersoll-Sergeant pattern, 10 in. x 10 in. in size. The compressed air is used to operate the drills in the mine, which are of the Ingersoll-Sergeant A 32 pattern.

## Miscellaneous Mining News.

### ALASKA.

The July report of the Alaska-Treadwell Mining Company shows 19,987 tons of ore worked, and 403 tons sulphurets treated, the latter yielding \$25,373 and the whole averaging \$3.60 per ton. The bullion product for the month was \$72,068.

Forty Mile Creek, on the American side, is now receiving a rush from Dawson. It is claimed that better and richer gravel has been found in Alaska than in the Canadian possessions.

### ARIZONA.

E. T. Loy has bonded the Homestake mine, Mineral Park, and will soon have a hoist on the property. The Homestake has produced considerable oil during the early boom.

Preparations are being made for the immediate erection of a forty-stamp mill on the Del Monte group of mines at Harqua Hala, Yuma county, recently sold to eastern capitalists.

The Copper Queen Company is constantly increasing its output, and from reliable sources it is learned that the present output is over 2,000,000 pounds per month.

Twenty-five men are now on the pay roll of the Spenazuma Mining Company at Black Rock. A smelter of 500 tons capacity is said to be on the way and ground is being prepared for it. The miners are engaged in running tunnels and crosscutting. Captain Thomas McInery is superintendent.—*Republican*.

### CALIFORNIA.

#### AMADOR COUNTY.

Superintendent John Truscott, of the Onaida, says that the result of the mill test made at the Zeila recently was not as good as hoped it would be, still it was encouraging. Since drifting commenced on the ledge, he has run about 1000 feet, and the ore tested was taken from these drifts, without stopes or upraise. On the north end a body of ore, about 300 feet in length, and varying in thickness from three to thirty feet, has been encountered; and, although its grade is not high, it is extremely encouraging for the company, and sinking to a greater depth will probably be commenced at no distant date.—*Amador Ledger*.

#### CALAVERAS COUNTY.

Superintendent Honnold, of the Thorpe mine, is rushing the work of improvement on the property. Grading has commenced for a thirty-stamp mill, and the shaft is being enlarged to a three-compartment affair.

An agreement has been filed for record whereby C. J. Decker purchases the Keystone and Bonanza King mines, situated in the El Dorado mining district, the price being \$30,000. The Keystone has a nine-stamp mill and all appliances on hand for reducing the ore, which is said to be very rich, but expensive to work.—*Amador Ledger*.

#### KERN COUNTY.

The Black Hawk mine, which has lain still for so long, on account of trouble in the ownership, is now being energetically worked, with excellent results.

A few days ago they struck a heavy body of ore, running all the way from \$20 to \$200 per ton. There are six to eight feet of this, and they are sacking it all. They are now taking out four or five tons per day, and have forty tons sacked and ready for milling.

At the 100-foot level, they have an 18 inch vein that will go \$50 per ton, with the prospect that it will get larger.

The Yellow Aster Mining Company, at their monthly meeting in August, made their July dividend \$35,000 instead of \$25,000, as at first contemplated.

Another very rich discovery has been made in the Little Butte. This time in the foot wall of the shaft, 287 feet from the surface. It appears that the shaft was sunk between two ore chutes, as good ore has been found on both sides. But, in examining the shaft the other day, Mr. Clark, in company with Mr. Meade, the foreman of the mine, discovered some very good looking ore at the above depth, and on further investigation struck a remarkably rich bunch of ore.

It is literally plastered with fine gold, and can readily be seen without a glass.

How much of it is there it is impossible yet to tell, but already enough has been taken out to make the owners feel very confident that eventually the Little Butte will prove one of the best mines in the district.—*Randsburg Miner*.

L. E. Porter & Co.'s new cyanide process plant, at Garlock, Kern County, will commence operations on 1st of September. The cost of the plant is \$7,000, with a capacity of 60 tons daily. They have 12,000 tons of tailings now waiting to be worked. It is the intention to maintain an assaying, cyanide and metallurgical department. The force employed at present will be 10 men.

#### LOS ANGELES COUNTY.

The work of repairing the caved shaft at the Red Rover mine has been commenced, and the mine will be ready for the extraction of ore by the last of September.

At the Puritan, formerly the Union mine, the two stamp mill was cleaned up after a run of thirty days. The results were very gratifying to the owners, though no figures are given for publication.

#### TUOLUMNE COUNTY.

Although the pocket mines continue daily to turn out gold, almost all of the big properties are hung up for lack of water. Prospectors are doing well in every direction, and the coming rainy season will mark a greater activity in mining than ever existed before.—*Union Democrat*.

Owing to the scarcity of water, many mills have had to shut down. This contretemps will seriously affect the gold output for '98, but those using steam are dropping steadily.

The Providence cleaned up for a seven days' run \$28,000.

The Rawhide, at the 1,200, have struck as rich gold as ever found in the mine.

The Rappahannock is crosscutting for vein from the 1,100 foot level.



## COLORADO.

W. Miller, who has leased the old south workings of the Pharmacist, on Bull hill, is sinking a new shaft which is now down 25-feet, and two feet of quartz has been uncovered. Pay assays have been had from this vein and ore is being saved for a trial shipment.

An important gold strike is reported having been made on the west slope of Gray's Peak, near the dividing line of Clear Creek and Summit Counties. The quartz is said to be very rich in gold, and, as the prospectors are now taking it out, will run \$280 per ton. This is aside from the silver, which runs 222 ounces to the ton. It is in the Horseshoe.

A new pump has been put in at the Silver Mountain property, at Empire, throwing a four-inch stream. Sinking of the shaft from its depth of 230 feet has been resumed, also the drifting on the various levels. Employment is given to twenty-two men in this work. The shaft shows five feet of pay ore, and the production is heavy enough from such development to keep the Clear Creek concentrator running. Aside from the milling streak, which is said to run on an average of \$10 per ton, there is an eighteen-inch streak of smelting ore that is worth \$60 per ton.

The owners of the Zenobia have decided to sink the main shaft on the property from the present depth of 350 feet to the depth of 600 feet. They have erected a new and larger hoisting plant to facilitate the work. The upper levels are being worked under lease by Simmonds & Co., who are producing considerable ore.—*Denver Daily Mining Record*.

Columbia Gold Mining and Milling Company, operating on Badger Creek, has completed arrangements to resume development on the Columbia, a claim which has been prospected the most, there being a 100-foot shaft and several feet of drifting. They will run a 400-foot tunnel to cut the vein. C. P. Miller, superintendent, is surveying for the tunnel and will commence as soon as completed to run this tunnel. Three shifts will be employed and work will be continued until the vein has been cut, which will be close to 500 feet from where the ore chute crops on the surface. The ore is a good quartz and carries 15 per cent copper pyrites, and will average between \$18 and \$20.—*Mining Investor*.

## IDAHO.

Development work has been in progress on the Black Bear mine, near Wallace, Shoshone county, since last February. A new strike is reported from the lower tunnel of ore eight feet wide, two feet of which is almost pure galena, assaying 65 per cent lead and 30 ounces of silver, and the remainder is good concentrating ore. The old tunnel was extended almost at right angles from the original direction, over 900 feet when the ore body was struck. The depth from the upper workings is 330 feet, so a vast amount of ground will soon be opened up.

This bids fair to be the banner year in Florence camp since the days of placer mining. With three stamp mills now in operation day and night, one more being installed and will be in operation in a few days, three mills ordered and now on the way, the camp can soon boast of an output of gold from Florence

that will surprise some, and will bring back a few of the old-timers left here to the recollection of '62 and '63, when gold was packed out on mule trains.

## MINNESOTA.

When the Carnegie Steel Company became a miner of ore on a large scale, and arranged with the Rockefeller interests for carrying its ore at a low figure, fluctuating only within narrow limits, the cry of monopoly went up, but no move ever made in the history of iron and steel manufacture was more plainly the product of an intensely competitive regime. The Federal Steel company is one of the late results of the entrance of the Carnegie Steel Company upon the Mesaba and Gogebic ranges. An immediate result was that ore contracts at Chicago were written with the price clause based on the mining cost of the Pittsburgh Company, and it was only a step from such an arrangement to an organization of the Illinois Steel Company and the company from which, because of common stockholders, it made its largest purchases of ore.

The prominence of Standard Oil stockholders in a new deal has been construed in some quarters as significant of close future relations between the two dominant mining and transportation corporations of the Mesaba ranges. And it has been only a step from this inference to the conclusion that the Standard Oil interest in the Lake Superior Consolidated Mines and the Bessemer Steamship Company might facilitate an understanding between the important Pittsburgh customer of the two latter companies and the new company. There is good reason to doubt the correctness of any such surmise. The indications are that the competition in ore between the two leading interests of the Mesaba range will be just as intense as it has ever been.

## MISSOURI.

The Arkansas City Lease Mining Company has leased 40 acres of the John Jackson estate, one mile south of Jackson Station, on which it has built a steam concentrating plant that will handle 100 tons of crushed ore every shift. They use steam drills to break the ground, as it is very hard, and only pump night time to furnish water to run the plant. The company is drifting at 110 feet, on a 25 foot face of disseminated ore, and is producing thirty to 40 tons of zinc ore every week. It employs at present 15 men.

Holmes & Company are drilling on the Missouri Central Company's lease, near Central City. At 58 feet ore was struck, and continued to 160 feet. They will drill to 200 feet before sinking a shaft.

The Opal Mining Company leases four lots on the Beckwith & Company's lease, south of Cartersville, where it has put up a large concentrating plant, which is producing from 30 to 40 tons of zinc ore weekly. It is putting in a 10 inch lift pump to get in the lower ground, where there is a 28 foot face of zinc ore. There was a good run of lead ore at 90 feet, and the company made on hand jigs 25,000 to 40,000 lbs. of lead ore weekly.

## MONTANA.

The Jay Gould Mining Company's stamp mill, in the Stemple district, was recently destroyed by fire. The loss is estimated at \$15,000.

The Butte Sampling Works will erect a new plant at South Butte, of 150 tons capacity. Work on it will commence at once, six lots having been purchased for the purpose.

Some good copper ore, from a good-sized lead, is being shipped from the Cora property of W. A. Clark, now under lease to the Montana Ore Purchasing Company. A new two-compartment shaft has been sunk to the 350-foot level, where the ledge was struck.

The trouble over the Nippur claim of the Montana Ore Purchasing Company with the Anaconda Company will soon be adjusted and the shipments of ore resumed. The Nippur has developed into a producer, and there is a large body of high-grade copper and silver, from which shipments were made up to the time of the injunction. The silver values in the Nippur ores run higher in proportion to the copper than in any of the big mines of Butte, with the exception of the syndicate group of the Anaconda Company.

## NEW MEXICO.

A rich strike has been made on the Corena, a generally considered valuable property south of the Washington mine. Some work has been going on there recently, and from assays on ore lately opened up, returns of 23 ounces gold to the ton have been obtained. It is understood that the present owners, W. S. Strickler, I. D. Dort, M. S. Otero and Charles Pilkey will begin extensive development on the rich property at once. This strike will have the effect of starting development also on the adjoining mines, all of which, when worked, have shown as good indications as the Corena prior to the present discovery.—*Bland Herald*.

The Cons. Kansas City Smelting & Refining Co., of Argentine, Kas., employs 60 men, and is shipping about 40 tons of ore per day from the Othello and Desdemona mines. These mines have produced more than 12,000 tons of ore per year during the past three years.

## Output Hillsboro Mines.

Output of Hillsboro gold mines for the week ending Thursday, Sept. 8th, 1898, as reported for the *The Advocate*:

	Tons
Wicks.....	15
K. K. ....	10
Richmond.....	15
Snake Group.....	50
Opportunity.....	15
Sherman.....	5
Cincinnati.....	10
Trippe.....	25
Rex (silver-lead).....	5
Total .....	150

Total output since January 1, 1898.—5,430.

## OREGON.

A rich strike is reported from the Noonday mine, Bohemia district. At a depth of 400 feet, the vein is eight feet wide, and free-milling ore, running from \$20 to \$100 per ton. They opened up a large body of ore sufficient to keep their 20-stamp mill running for several years. The company is going to run 300 or 400 feet more of tunnels before starting their mill, in order to have levels to block



out before stoping commences. There are already 3,000 feet of tunnels in this mine. The force will be increased to rush the tunneling.

One of the best mine showings in the Cable Cove district is that of the Eagle group of mines, consisting of twelve claims. In the Imperial mine alone, the entire length of a 500-foot tunnel there is a ledge, from  $3\frac{1}{2}$  to 4 feet wide, that gives an average return of \$17 to the ton. On the Eagle group there are fully 3,000 feet of development work done.

## UTAH.

A strike is reported in the old Oregon near Alta, at a depth of 375 feet in the shaft which was begun many years ago. Recently work was resumed by putting the shaft down a few feet deeper, uncovering a streak of galena which will run high in silver and lead. Work will continue throughout the season.

James E. Malone and Theo. P. Heming, of Juneau, Wis., have secured a \$30,000 bond on the Glencoe joining the Overland on the north. The incline shaft, down over 100 feet, is to be put down 150, and from the bottom 150 feet of drifting is to be run.

At Marysville, on Gold Mountain, all the older properties are working steadily and continuing to improve.

## WASHINGTON.

The workmen on the Princess Maud were engaged in straightening up the incline shaft. This became necessary as the ledge, which had taken a pitch of about 35 degrees at the beginning, jumped to about 95 at 50 feet. It is now going down almost perpendicular, and it is not at all likely that it will deviate from that course. The shaft has been ventilated by iron pipe and Sibley stove, and is now not only safe for the workmen but makes the shaft delightfully cool, as the fresh air rushes in to fill the vacuum made by that exhausted through the pipe. The shaft will be in good shape in a day or two, when sinking will be resumed. The ore in the bottom is of high grade and good quality.—*Miner and Electrician.*

## FOREIGN MINING NEWS

### BRITISH COLUMBIA.

The Fort Steele Development Syndicate of London, Eng., has taken a bond on the Moyie and Queen of the Hills, which are direct extensions of the St. Eugene mine. Mr. Wallinger, the local manager, has made arrangements for work to re-commence right away. Mr. I. Williams, late foreman at the North Star mine, will be in charge. The Moyie and Queen of the Hills have over 300 feet of tunneling besides open cuts and shaft on them, considerable ore having been taken out. Average value of the ore is from \$55 to \$60 per ton. Silver 45 to 60 oz., and lead 50 to 65 per cent.—*Mining Critic.*

The Lilloet Prospector says the main tunnel in the Bend 'Or mine on Cadwallader is now in 300 feet, and is fully as rich as when work was first started. The ledge is 2 to 3 feet wide, well defined and showing free gold, and every shot that is fired brings forth some excellent specimens. There are now over 500 tons in the bins. The ledge on the surface is stripped for 1,800 feet and shows free gold.

## MEXICO.

### Important Mining Deal.

Rumors in regard to an important mining deal recently promoted in New York by J. P. Flynn, of this city, have been rife in mining and commercial circles here for some days, says the *Monterey Globe*, and gives the following as the facts:—

The Mexican Metallurgical Company of San Luis Potosi and La Plata Mining Company of Monterey, recently organized the Chrysolite Mining Company, with a capital of \$500,000, and transferred to it their holdings in the eight mines known as the San Felipe group, located in the Sierra Madre mountains, near the terminus of the Monterey Mineral Railroad, ten miles south of these. The new company purchased the interests held by J. A. Robertson and J. O. Rice in these properties, paying therefor at the rate of half a million dollars for the whole.

The Denver mine, one of the largest and best properties in the district, owned by La Plata Company, has been leased to the Chrysolite Company for a term of 20 years. The combined properties cover 370 acres, located in the center of the most important silver and lead mining district in the Republic of Mexico.

Plans have been adopted for working systematically on a large scale to open up the vast ore bodies known to exist on these properties. Four crosscut tunnels will be driven, north and south, varying in length from 500 to 1000 feet, with the necessary connecting shafts and winzes. The main tunnel is to be driven on the vein from east to west, 400 feet in length, traversing all of the mines. It will be 3,200 feet below the existing works of the Denver mine.

The present force of 200 miners will be increased to 1,000 within the next few months. Modern methods will prevail in working this big consolidation. An electric plant will be installed for lighting, ventilating and running power drills. The equipment will include telephone lines, aerial cables and surface tramways.

The temporary officers named in the charter are: D. C. Brown, president and treasurer; E. L. Wagner, secretary. A meeting of the stockholders at San Luis Potosi has been called for Sept. 15, at which the following board of directors and officers will be elected: President and treasurer—Robert S. Towne, New York. Vice-president and general manager—D. C. Brown, San Luis Potosi. Directors—Robert S. Towne, D. C. Brown, T. J. Ryder, Hon. E. Shepard, New York; J. P. Flynn, Monterey.

### RECENT ADVANCE IN SILVER-LEAD SMELTING.

Concluded from our issue of September 7, 1898.

The return to the withdrawal of furnace gases overhead, instead of the innovation of under the feed-floor, may be regarded as one advance, reducing fine dust production and admitting of more correct feeding of the charges. Better and stronger water jackets, with simplicity of tuyere fittings, may be regarded as an advance.

Large settlers for the separation of matte are coming into general use. These are made rectangular and of sectional side and end plates, and lined with brick to reduce loss of heat.

Improved means of slag disposal rank as a great advance. One system employs a bowl

or bowls mounted upon a railway truck; the clean settler overflow slag being dumped hot; the other system, which is certainly the most advantageous, but only possible with an adequate water supply, is that of granulation; where the stream of slag is struck by a jet of water, and reduced to granular form that will all pass a one quarter-inch mesh sieve. It is conveyed by water to an elevator, and is thence handled automatically to the point of delivery upon tram or railway cars; the employment of conveyors to carry this material to a dump is about to be adopted.

I find that a jet of water, from a slightly flattened two-inch pipe, under a thirteen foot head is ample for the purpose of granulation; the region of the trough where the stream of slag falls is of necessity water-jacketed to prevent adhesion of slag to iron of pieces that may pass the jet of water. The granulated slag is conveyed by the jet and jacket water down short troughs, leading from each furnace into a longitudinal main, two feet wide with cast-iron bottom, and sloping one quarter inch to the foot. Water, for carrying 100 tons slag per day to an elevator pit 100 feet distant, is supplied from a ten-inch square box under 13 feet head. Heavy rubber belts and malleable cast-iron buckets render good service. This system of slag disposal is growing in favor, and is certainly to be preferred to all others when practicable. It is the only system from which a perfect sample of the slag can be obtained.

Artificially ventilated buildings, with paved tapping floor, constitute a great advance as a sanitary and economic measure. These are gradually supplanting the cramped structures of the past. Better service is secured and ore and rich products instead of being trodden in adobe floors can be easily and regularly recovered.

As the blast furnace operation depends almost wholly for its success upon the reducing gases passing upward through the charge, it is clear how important it is that these gases have free and well distributed passage. This necessitates a certain degree of porosity of the column of material in the furnace. Along with these gases much fine material is carried, constituting what is known as flue dust. Its successful condensation is very important. American progress in this direction consists in making flues aggregating one mile in length, in which the gradually cooling gases deposit fine particles held in suspension, and such particles, all carrying values, are found at the base of the very tall chimneys employed for artificial draft.

Europe, earlier active in all industrial economies, had long ago led us in the employment of very long flues.

The other system for accomplishing the same results in a quicker manner consists in aspirating the furnace through an iron flue, and thus being sufficiently cool, they are forced with the same fan through inclined planes, nearly vertical, of cotton cloth. When the accumulation of deposits upon the huge filters is indicated by an increase in pressure, as shown by a gauge, rocking shafts with arms shake off the solid matter, which is precipitated to the bottom of the large brick buildings.

As mines have deepened, and the percentage of sulphurets in ore has been increased, the problem of roasting has become one of increasing importance. In early days, heap roasting of mattes and coarse ores was universal in this valley. Then came the short-hand reverberatory, then the long one; and now, in Utah, automatic roasting furnaces have almost wholly displaced the hand-



worked variety. Whole batteries of hand furnaces have been discarded at a cost of \$3,000 each.

There are various types of the automatic, all having certain merits, and all their champions among metallurgists.

The Bruckner cylinder is much in favor in Salt Lake Valley; the repairs are light, labor and fuel low; the time for oxidation not limited, as in Rabble furnaces; and since the economical briquetting of flue dust was introduced, the production of that material is not the great objection that it once was. Ores containing 32 per cent, containing 30 per cent zinc and 10 per cent lead offer no difficulty, but require careful firing. The present and latest practice is to employ very large cylinders, 26½ feet by 8½ feet, and run them very slowly, one turn in forty minutes; the charge being 17.22 tons, and time 36 to 48 hours. I understand cylinders 28 feet long are in contemplation.

The first Rapp roasting furnace in this state was erected in the summer of 1896. Two years of use have proven it to be an excellent type of Rabble furnace, requiring little labor and, compared with hand furnaces, little fuel; not costly to maintain, and capable of treating a wide range of ores with a very small make of flue dust. With structural changes, developed as necessary by experience, this furnace certainly will occupy an important place and a permanent one, among straight line Rabble furnaces. The furnace built at the Hanauer Works in 1896 had the following dimensions: Width of hearth, 14 feet. Total length of hearth exposed to heat, 129 feet 6 inches. Number of fire boxes, 4. Area of each, 20 square feet. Number of rabbles, 6. Speed of rabbles, per minute, 80 feet. Capacity in 24 hours, 25 to 40 tons.

There were roasted in ten months in this furnace, 10,839 tons, of 2,000 pounds each, of Bingham ore, of the following composition, as shown by a partial analysis: Silica, 10.00; sulphur, 39.42; iron, 31.52; lead, 9.20; zinc, 4.23, with the following results: Average sulphur in roasted ore, treating 39.18 tons, per 24 hours, 6.37. Average sulphur in roasted ore, treating 34.78 tons, per 24 hours, 5.75. Average sulphur in roasted ore, treating 30.00 tons, per 24 hours, 5.10.

Ore of the following composition is successfully roasted without slagging, to 5.4 per cent sulphur: 26.10, lead; 18.00, silica; 14.50, iron; 11.80, zinc; 26.90, sulphur.

A four hundred ton lot of ore of the following composition was treated at the rate of 25 tons per day to 6.7 per cent sulphur, and showing an oxidation of 66.10 per cent of the zinc, which existed as blende in the ore: silica, 9.20; zinc, 16.70; iron, 16.60; lead, 17.40; sulphur, 29.00; copper, 4.20.

All the ore was crushed to pass one quarter inch mesh screen and yet but 11,000 pounds of flue dust were caught in 107 feet of flue.

It is found that the travel of the rabbles of this furnace exterior to the furnace, for a greater distance than they travel through the hot region, contributes to their endurance. The set remotest from the fire has roasted 16,569 tons of ore and matte, and still good; that nearest the box required renewal after roasting 14,419 tons of material.

One multiple hearth, Kellar, roasting furnace has been erected in Utah. It is beautiful in its mechanism, low in fuel consumption, but not capable of treating so wide a range of ores as might be desired, as it depends upon the burning sulphur in the ore more for a source of heat than other furnaces.

Improved crushing machinery has exerted

some influence in lowering the cost of preparing ores for roasting. I have had better success with chilled iron roll shells than with soft steel ones. The "briquetting" of flue dust and fine ores, such as the roast furnace product, and concentrates in general, has proven a most economical substitute for fusion, as a means of rendering this class of material coarse.

The latest development of the briquetting machine produces sixty to seventy tons per day of small hardened flat rounded discs, under great pressure, with caustic lime as a bond, they quicken the blast furnace operation, and greatly contribute to general cleanliness about the works.

The rotary blowing machine is now made of great strength, with heavy shafts, cut steel gear, large pulleys, long and improved journals, all resulting in a machine suited to high pressure and steady service. Compared, however, with the piston blower, it is an imperfect one, as the latter is the only positive machine that can deliver all the air which enters its cylinders. One western works is installing such a plant, although at a cost of fifty per cent greater than the rotary.

The eight-hour law for mining, smelting and other unhealthy pursuits, which has been in force in Utah since June 1, 1896, though at first working a hardship upon employers, as it resulted in a slight advance of wages, has proven less of a bugbear than it at first appeared. The quality of the service in smelting has improved, and, as an economic measure, the general eight-hour system must have far-reaching value and be of national importance, as tending to employ fifty per cent more men in pursuits operated 24 hour per day, improve their moral and physical condition, promote human happiness and the coveted harmony between capital and labor.

#### THE TECHNOLOGY OF CALIFORNIA BITUMENS.\*

The late publication of a paper, in which Professor C. F. Mabery describes certain researches upon California petroleum, leads me to put on record what has been done upon the technology and chemistry of California petroleum, in the thirty-two years that have elapsed since 1865.†

Prior to that date, a reconnoitring party, accompanied by Prof. Benj. Silliman, Jr., had visited Southern California and had examined the deposits found in the valleys between Los Angeles and Santa Barbara. On his return to the east, Professor Silliman made reports, based largely upon personal opinions, that were very widely circulated, but which subsequent events proved were based upon erroneous conclusions. A potent factor in the formation of these opinions was an examination of samples, made by several distinguished chemists, which samples were afterwards proved to have been grossly falsified.‡

Meantime, two companies, with vast resources on paper, purchased two large tracts of land, and equipped and sent out to Santa Barbara and Los Angeles counties a corps of superintendents and engineers who were expected to develop a petroleum region that should rival that of Pennsylvania. The California Petroleum Company operated on the Ojai Rancho, north of Ventura; the Phila-

delphia and California Petroleum Company operated on the Simi, Las Posas and San Francisco Ranchos, farther east; in the canyons of the Sulphur Mountain, the Hayward Petroleum Company and Stanford Brothers were obtaining petroleum from pits and tunnels, and in the mountains west of the San Fernando Pass several parties were obtaining dense petroleum or light malthas in like manner. A small refinery was in operation on the San Francisco Rancho, but the larger part of the oil produced was obtained from the canyons of the Sulphur Mountain, and was sent up the coast to refineries on San Francisco Bay.

During the summer of 1865 Drs. John Torrey and C. T. Jackson had visited the Ojai Rancho, and had made a report that to some extent confirmed the statements made by Professor Silliman. The last-named gentleman had also made experiments in Boston upon some of the "surface oil," so called, from Santa Barbara County. The oil or maltha was obtained from the Ojai Rancho, and when "cracked" yielded a distillate equal in volume to about 60 per cent of the crude maltha, that when treated was pronounced a fair quality of burning oil.

In June, 1866, I made a reconnaissance of the region and prepared a report for the State Geologist of California, in which I showed that, in the ten months preceding, 2,448 barrels of crude oil had been shipped to San Francisco, while the remainder of 7,000 barrels was allowed to run to waste. Very little merchantable oil was made from this crude. I took a number of samples with me when I left the Pacific Coast, and I subjected them to a series of experiments, the results of which may be summed up as follows: Distillation under pressure produced a fair yield of illuminating oil, which had a fine appearance but did not burn well. There was also a fair yield of lubricating oil of good quality. I also made an ultimate analysis of some of the California oils, and showed that they contained nitrogen and sulphur, and that the percentage of hydrogen was low.

My conclusions were thus stated, that "the best refined petroleum that I have made, either in California or at the East, and also the best that I have seen from other sources, fails to produce a light of such intense whiteness as the best refined Pennsylvania oils. It is my opinion that this difference is due to the admixture of the 'benzole' series, or, perhaps, some other, containing a large amount of carbon in proportion to the hydrogen, in such quantity as to render the combustion incomplete, and thus produce a yellow flame."

The reports that I made to the State Geologist of California were unfortunately involved in the catastrophe that overtook the survey, and were not published until 1882, and then in a very limited edition, as Professor Whitney expressed it, "to furnish copies for the learned societies." In these reports I insisted that California had veritable oil interests; that the crude oils were totally unlike those of Pennsylvania, yielding peculiar products of manufacture, and that no more inviting or promising field for chemical and technical research could be found than these bitumens present. In closing my last report, (January, 1871) I made use of the following language, "The vast accumulation of the raw material in the southern counties, which, though proved of but little value in its application to purposes and processes at present well known, is, nevertheless, an immense storehouse of material force, which only needs to be studied to be found of the greatest value

\*From the Journal of the Franklin Institute, devoted to science and the mechanical arts; a paper read before the stated meeting, Tuesday, December 21, 1897, by S. F. Peckham.

†C. F. Mabery, *Am. Chem. Jour.*, 19, 796.

‡B. Silliman, *Am. Jour. Sci.*, 11, 39, 341; S. F. Peckham, *ibid.*, 43, 345.



as a source of fuel, if nothing more. It must constantly be borne in mind that this variety of bitumen is essentially a new substance of unknown applications, which may be discovered either by research and comparison with other and better known varieties, or by the longer, more laborious and expensive process of empirical experiment." Professor Whitney was so far impressed with the importance of these facts that, during the last year of the Geological Survey, plans were perfected by which I was to spend a couple of years in the laboratory of the University of Berlin in conducting these researches. These plans were also involved in the wreck of the Geological Survey.\*

For a number of years California bitumens attracted little attention. At the time I prepared the report on petroleum for the Tenth Census of the United States, I could not convince Gen. Francis A. Walker that there were any petroleum interests in Southern California that would warrant the expense of an investigation and report. In this conclusion he was mistaken, as at that time a large number of productive wells were in successful operation in Ventura County.

About 1890 or 1891, the different interests in the neighborhood of Santa Paula, Ventura County, consolidated into the Union Oil Company of California. This company built a refinery at Santa Paula, and soon after called Dr. Frederick Salathé to assist them in the technology of the various oils that were received at the refinery from the different wells in the vicinity. The Pacific Coast Oil Company, which was operating farther east in Los Angeles County, always had an advantage in the business of refining, inasmuch as their crude oil was lighter in specific gravity, and yielded a larger product of light distillates, which commanded a more ready sale than the heavy ones. Their refining had always been done at Alameda Point, in San Francisco Bay, to which place the crude oil was shipped in tank cars.

Dr. Salathé had entered upon his work at Santa Paula with a laboratory well supplied throughout except in one particular—there was no gas in that part of the country, and alcohol and gasoline were poor substitutes for gas, which has become almost an absolute necessity with modern methods and apparatus. His technical apparatus left nothing to be desired. He had also entered upon his work with the understanding that he could convert a large part of the California bitumen into benzole, and thus inaugurate a profitable technology. I have been informed that the Pacific Coast Oil Company had had their crude oil fractionated with results that showed a large proportion of the series  $C_n H_{2n-1-2}$ . Dr. Salathé professed to have reached similar results with the Santa Paula oil, and to have solved the same problem that he had solved when he converted petroleum into benzole.

There were other problems to which Dr. Salathé gave his attention. He had extracted the bitumen from the Turrellite of Texas and called it Lithocarbon. It proved to be a sulphur bitumen. He had treated the asphaltic residuum of California petroleum with sulphur and called the product Petrocarbon. He also oxidized one of the California distillates for use as a basis of printers' ink and called that Linolith. He re-invented the use of caustic lime instead of caustic soda in the treatment of distillates, a process first used by Selligie about seventy years ago. He also invented a process for

treating lubricating oils by diluting them with naphtha, and then, after treatment, distilling off the naphtha. After Dr. Salathé had been with the company about a year and a half, and had applied for patents on all of these processes, I was asked to visit Southern California and help Dr. Salathé get these numerous patents through the Patent Office. After I had been engaged in this work for some time I was informed by Dr. Salathé that he had discovered that the crude oils and their distillates contained nitrogenous basic oils, and we at once set about contriving methods for removing them from the distillates, thereby improving the products in various ways. After a time, Dr. Salathé left the employ of the company and I was placed in charge of the refinery, in addition to other work.

The refinery was, for the most part, one that had been originally set up in Pennsylvania and had been taken down, carried to Santa Paula and reconstructed. It was at first operated profitably on very crude and cheap products, but it was found wholly inadequate to meet the demands of a market rendered fastidious by the highly-finished output of eastern refineries, and especially when required to treat such a variety of materials as finally passed through it. It was also used as a loading station for a large amount of heavy fuel oils.

The crude oil used in the refinery were of different colors, from green to black, and of specific gravities ranging from 20° to 35° B. These oils were distilled to a variety of residuums that differed in consistency from heavy oils or tars to brittle solids. There were made five grades of solid asphaltic residues, a dense paving flux that would scarcely flow, a more fluid paving flux and a reduced green oil, called "skid oil," that was used to grease the skids in the lumber districts up the coast. From the distillates from these residues were made gasoline, naphtha, gas oil of 40° B., an oil of 28° B., and several grades of lubricating oil, light and heavy, treated and untreated.

The three stills were connected with condensers that were cooled in one box, a very bad arrangement. To make such a variety of residuums, reduced oils, etc., in three stills required constant changing and cleaning, with an enormous loss of time, and the omnipresent difficulty occasioned by soiling the product of one distillation by that of the previous distillation. It was also impossible to so perfectly clean the stills, agitators, tanks and tank cars that the second charge was entirely free from the previous charge, yet some very good oils were made. The engineers of the locomotives of the Southern Pacific Railroad frequently filled their cans with our oil, declaring it was very much better than that which was provided them from some eastern refinery, and the Superintendent of Motive Power admitted the superior quality of our oils, but declared his inability to use them, as he was not the purchasing agent.

The gasoline and naphtha, while possessing a very different odor from articles of the same name and density made from eastern petroleum, were not found to be practically different when applied to the same uses. No burning oil was made. One batch was turned out without regard to cost as an experiment. In this instance the crude distillate was carefully washed with dilute sulphuric acid to remove basic oils. It was then carefully treated with oil of vitriol and caustic soda and finished by distillation. It was beautiful.

(To be continued.)

## PERSONAL NEWS ITEMS

The MOTT BROTHERS, of Perris, Riverside County, Calif., have shut down their asbestos mine at Winchester, near Perris. They do not, however, intend to abandon the property.

THOMAS WALSH, owner of the Camp Bird mine, Ouray, Colo., is sojourning in Salt Lake City.

J. C. CHRISTY, who is hydraulicking in Lytle Creek, San Bernardino County, Calif., is having trouble with the City of San Bernardino. Mr. Christy says his claim to the water is over a quarter of a century older than that of San Bernardino.

S. J. FLEMING, superintendent Providence G. M. Co., Bigbug, Ariz., has returned from California.

W. R. RUST, superintendent of the smelting works at Tacoma, Wash., is at San Francisco.

JUDGE PURCELL is in Los Angeles, Cal., from the Canyon del Oro district and brings encouraging news. The new gold find still continues to develop.

R. G. LECKIE, of Truro, Nova Scotia, visited New York last week.

D. W. BALCH, formerly of the Comstock, has returned from an eastern trip to San Francisco.

W. H. SLIPPER, after looking over the Lillooet district for the past few weeks, returned to Vancouver, British Columbia, last week. He will probably go east and may visit that section again before long.

PROF. R. A. F. PENROSE, Jr., devoted several days last week to the region around Hailey, Idaho. From there he expected to go to Cripple Creek and Denver.

CLARENCE SHARON, prominently identified with the Comstock mining interests for the last twenty-five years, has taken up his residence in San Francisco.

DAVID MOFFAT, the well known mine operator, of Colorado, has just returned from Europe. He is now stopping at the Fifth Avenue Hotel in New York City.

A. M. KELLY, who sold the Murphy mines near Tuscarora, Nev., for \$150,000 to the McDermot Bros. of Butte, Mont., and Los Angeles, Cal., is in San Francisco, Cal.

HERMAN A. KELLAR arrived in New York last week, on his return from a long professional trip through Chile, Peru and Bolivia. He is on his way to San Francisco.

PROFESSOR W. B. RISING, of the chemistry department of the University of California, has returned from Europe, where he attended the meeting of the International Chemical Association as a delegate from the Pacific Coast.

JOHN O. McDONALD, general manager of the Beneficiadora del Conchenco, at El Conchenco, Chihuahua, Mexico, is at present in Chicago. Mr. McDonald is on his way to New York on business for his company.

CAPTAIN THOMAS COUCH, formerly of the Merced mine, Cal., is now in Alaska studying the outlook for copper mining in that region.

WALDEMAR LINDGREN of the United States Geological Survey, is at Hailey, Idaho, examining the geological structure of the Wood River valley.

J. SIMPSON, manager Eureka mine, Grants Pass, Oregon, has returned from San Francisco, where he purchased a cyanide plant and several concentrators.

A party of four who have been camping in Lillooet, British Columbia, for the past week left on Tuesday for the Blackwater district. The party consisted of W. H. DEXTER and his son A. D., and J. McPHERSON and son, all of Vancouver. They will thoroughly prospect the Blackwater.

## Obituary.

CHAS. OSBORNE, a well-known California miner, died at Bulawayo, South Africa, July 10th.

JOHN PERSCHBAECKER died at San Francisco, aged 75 years, from a paralytic stroke. He was the discoverer and original owner of the famous Perschbaecker mine, three miles northeast of Magnolia, in Butte county, Cal. At the time of his death he owned the Napoleon group of mines in Mexico, which are managed by his son.

JAMES A. NEWLAND, one of the pioneers of British Columbia died at Vancouver Monday night, Aug. 15. He was born in Indiana, and was 66 years of age. He crossed the plains in early days and in 1858 went to British Columbia and has ever since resided in the province. He was one of the early residents in the town of Lillooet and for the past few years has resided at Ashcroft.

\*S. F. Peckham, "Reports Geological Survey of California," Geology, II, Appendix, 49-50.







## KAINIT.

Invoice weights as taken at port of shipment per ton of 2,240 lbs. testing 12.4 per cent. actual potash, equivalent to 23 per cent. sulphate of potash, \$8.55 @ \$8.80 for New York and Boston; \$8.90 @ \$9.15 for Norfolk, and Philadelphia; and \$9.05 @ \$9.30 for Charleston, Savannah, Wilmington, N. C. and New Orleans.

## NITRATE OF SODA.

Spot nitrate is in ample supply and buyers have the upper hand for the present. We have again to quote a little lower price, \$1.50 @ \$1.55 per 100 lbs. for spot. The same figures are quoted for futures, in view of the quantities known to be afloat for New York.

## FINANCIAL NOTES.

The statement of the United States Treasury, on Thursday, Sept. 1st, shows balances in excess of outstanding certificates as below, comparison being made with the statement for the corresponding date last week:

	Sept. 1.	Changes.
Gold.....	\$216,387,616	L. \$ 2,811,553
Silver.....	19,351,997	D. 571,258
Legal Tenders.....	54,139,822	I. 2,177,340
Treasury Notes, etc.....	4,401,812	D. 254,381
<b>Totals.....</b>	<b>\$285,201,822</b>	<b>L. \$ 9,575,254</b>

Treasury deposits with national banks amounted to \$65,254,168, an increase of \$2,675,665 during this week.

There has been a steady gain in the cash balance of the Treasury from the proceeds of the new bonds. It is estimated that about \$125,000,000 has been received thus far from these bonds. At present bonds of \$500 or less are only being distributed to subscribers. Notices of allotment are, however, still going out for the larger amounts, but the bonds themselves will not be dispatched until the small bonds have been distributed.

## Average Monthly Prices of Silver.

In New York per ounce Troy, from January 1st, 1898, and for the years 1897 and 1896:

Month.	1898	1897	1896
	Cents.	Cents.	Cents.
January.....	56.77	64.79	67.18
February.....	56.07	64.67	67.07
March.....	56.30	65.05	68.40
April.....	56.02	61.85	67.92
May.....	56.98	60.42	67.78
June.....	58.61	60.10	68.69
July.....	59.06	59.61	68.75
August.....	59.54	59.19	67.94
September.....	59.24	59.24	65.63
October.....	57.57	57.57	66.05
November.....	57.91	57.91	64.93
December.....	58.01	58.01	65.24
<b>Year.....</b>	<b>59.79</b>	<b>67.75</b>	

## Average Prices of Metals per lb. in New York.

Month	Copper	Tin	Lead	Spelter
January.....	10.99	13.87	3.65	3.96
February.....	11.28	14.08	3.71	4.04
March.....	11.05	14.38	3.72	4.25
April.....	12.14	14.60	3.93	4.26
May.....	12.00	14.52	3.64	4.27
June.....	11.89	15.22	3.82	4.77
July.....	11.63	15.60	3.95	4.66
August.....	11.89	16.23	4.00	4.58
September.....	—	—	—	—
October.....	—	—	—	—
November.....	—	—	—	—
December.....	—	—	—	—

## Gold and Silver Exports and Imports.

At all United States ports, June, 1898, and years from January 1st, 1898 and 1897:

	Coin and Bullion Exp.	Imp.	In Ores Exp.	Imp.
Gold—				
June.....	\$ 375,590	\$ 3,184,774	\$.....	\$145,838
1898.....	6,049,560	99,244,751	72,441	2,639,942
1897.....	25,000,717	3,715,249	93,188	2,229,314
Silver—				
June.....	4,156,650	799,755	.....	1,229,048
1898.....	24,392,928	3,202,116	112,699	9,275,271
1897.....	27,894,960	4,419,889	259,150	10,660,481

This statement includes the exports and imports at all United States ports, the figures being furnished by the Bureau of Statistics of the Treasury Department.

Exports of specie from San Francisco for the month of July were as follows:

	Gold	Silver	Total
To Hong Kong.....	\$8,570	\$1,500,818	\$1,509,388
To Honolulu.....	100,000	1,000	101,000
To Central America.....	500	7,990	8,490
To Mexico.....	500	—	500
To New York.....	2,148,568	203,588	2,352,156

Totals.....\$2,257,638 \$1,713,306 \$3,970,944  
Totals, 1897, 1,187,187,140 1,336,809 2,523,949  
The silver included \$365,088 in bars, \$1,534,218 in Mexican dollars, \$8,500 in Peruvian sols, and \$5,500 in United States coin. Of the gold \$2,253,638 was in coin and \$4,000 in bullion. All the gold bullion went to New York.

Indian exchange remains steady and all the Council bills offered in London were taken at an average of 15.91 d. per rupee. The present price of silver is above the Indian limit and no silver is going forward just now, though a considerable amount was sent last week.

Imports of specie at San Francisco by water for the seven months ending July 31st were as follows:

	Coin.	Bullion.	Total.
Gold.....	\$14,558,947	\$1,887,145	\$16,446,092
Silver.....	136,633	744,661	881,294
<b>Totals.....</b>	<b>\$14,695,580</b>	<b>\$2,631,806</b>	<b>\$17,327,386</b>
Totals, 1897.....	—	—	1,718,005

The sources of the imports this year were Australia, \$13,464,866; Japan, \$2,199,447; Hawaiian Islands, \$142,092; Central America, \$13,888; Mexico, \$1,356,942; British Columbia, \$147,637; miscellaneous, \$2,614. The large increase this year was chiefly in gold from Australia.

## MINING STOCK MARKETS.

NEW YORK, Sept. 2, 1898.

Interest is still lacking in this market and little hope is manifested by speculators for more active business in the near future.

The Colorado stocks, especially those of Cripple Creek, have been favored somewhat by the heavy gold receipts at the Denver Mint.

The dividend payers in the Cripple Creek District hold their own pretty well, and in the case of Portland the price has risen in the Western market from \$1.19 to \$1.48, owing to a reported discovery in the eighth level of this mine.

The Comstocks remain featureless.

The Yellow Jacket Silver Mining Company will be known hereafter as the Yellow Jacket Gold and Silver Mining Company. This change was made at the recent stock holders' meeting, when W. G. Morrow was elected vice president and James Newlands transfer secretary, with an office in San Francisco. The president is J. W. Eckley, and the secretary, W. H. Blauvelt. The object of reincorporating is to change the par value of the company's shares from \$100 to \$2.50. The number of shares remains at 120,000.

BOSTON, MASS., Sept. 1, 1898.  
Copper stocks are decidedly dull, and almost without exception inclined toward lower prices. The market appears to have been overbought, and any attempt at realizing, results in a slack demand and limited market. Calumet dropped off to \$585 on light transactions and Montana just about holds last week's price of \$227, after selling as high as \$231. Butte is weak at \$23½ on the published statement that the assessment money is practically exhausted, without reaching results from the underground explorations hoped for by the management, and that it is probable that a floating debt will be accumulated. The inside buying of Osceola continues on without any reaction; stock is only fractionally lower at \$66½. Continental is off \$18½, after selling at \$21 early in the week. Old Dominion holds its own about \$29, and good judges expect to see it sell higher. Arnold is on the down grade, declining from \$17½ to \$16¾. There has been some business done in Franklin, but the stock is heavy at \$14. Quincy is strong, finding a broad market at \$119 @ \$130. Atlantic declined three points to \$26 without rally.

SALT LAKE CITY, UTAH, Sept. 2, 1898.  
Ajax holds well on its recent advance, and the reported encountering of a new body of copper ore assisted in sustaining the price. The report of the shipping of higher grade ore than is customary has caused Anchor to advance sharply. Bullion-Beck slumped. Continental-Eureka was unchanged.

Dalton has levied assessment No. 13 of ½ cent per share, payable September 26. Dalton & Lark was dull and inactive. Daly and Daly West maintained last week's figures. Dexter's advance was fairly held. Four Aces was unchanged. Galena slumped heavily, due doubtless to the poor showing in the mine. Geyser-Marion's dividend of \$6000 was paid on the 1st. Reports of mine and mill conditions are favorable. Grand Central is gradually taking up its recent decline. The regular dividend of 14½ cts. per share, or \$31,250 will be declared on the 3d.

SAN FRANCISCO, CAL., Sept. 7, 1898.  
Mining stocks were firm and several showed a small advance.

The Crown Point assessment falls delinquent in office Sept. 8.

Local securities were less active than of late, though a fair business was transacted. Quotations remained the same.

Alpha does not show much life. There is no change in Alta. Belcher is sold at 16 cents. Best and Belcher is advancing considerably and 24 cents was bid at the closing, while it opened with only 18 cents bid. Chollar has receded somewhat, but closed with 16 cents bid. Caledonia also dropped off a little. Consolidated California and Virginia is holding up well and closed at 46 cents. Gould & Curry advanced considerably in the afternoon session, but closed weak. Confidence holds steady at 44 cents. Mexican remains steady at 16 cents. Occidental shows a strong advance and is now selling at 68 cents. Hale & Norcross is looking well. The stock is selling at 82 cents, but is not expected to advance much above that figure.

## WANTS

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WANTED, by a young man, a position as Assayer, etc.; experienced, competent and has a good knowledge of all metallurgical operations. Good references. Address, T. K. JOURNAL OFFICE, Stimson Block, Los Angeles, Cal.

WANTED—Situation by Millman and Assayer; Wages reasonable; Good references. Address "H" JOURNAL OFFICE

EXPERIENCED Assayer and Cyanide operator desires engagement. The successful and economical treatment of slimy ore or tailings by cyanide a specialty. Address W. V. WATSON, Ely, White Pine Co., Nev.

AN EDUCATED Chemist and Millman, thoroughly understands Milling, Chlorination and Cyanide Processes. Twelve years experience in Montana and Colorado, now open to an engagement. Moderate salary. Address: "Chemist" JOURNAL OFFICE, Los Angeles, Cal.

## Mine Wanted

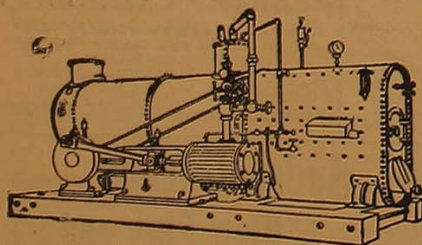
MINING MAN of experience will develop Gold property of merit for ½ interest, or will bond whole mine and develop. Correspondence with owners only. Give full particulars. Will give satisfactory references. Address P. O. Box 887, Los Angeles, Cal.

## FOR SALE!

I HAVE some good gold mining properties for sale at reasonable prices, some developed and some real good properties at Ward, Eldora, Gold Hill, Jamestown, Magnolia, Caribon and Sugar Loaf. Write stating what you want or call on me. JAMES M. NORTH, Former County Judge, BOULDER, COLO.

A FINE Copper property in Mexico. A one-half interest in a good producing copper property will be given for required capital to do the necessary development work and placing machinery thereon. Substantial guarantee. Address "MINER," 1032 Mission St., San Francisco, Cal.

A VERY valuable, extensive Lead Mining Property in Southwest Virginia. Shafts sunk over 200 feet and actual work has demonstrated richness of veins and purity of ore. Address: GEORGE FRANK, Baltimore, Md.



Write for Catalogue and Prices.

RUSSELL & CO. PORTLAND, OREGON.

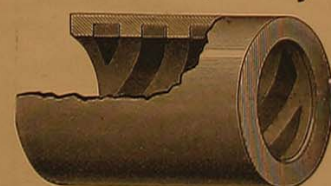
Chas. P. Grimwood,

Mining Engineer and Metallurgist

Laboratory, 214 Pine Street,

SAN FRANCISCO, CAL.

## Oilless Bearings,



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Rope Tramways, HOISTING Engines, Tackle Blocks, Cam Shafts in STAMP MILLS. A Practical BEARING that RUNS WITHOUT OIL

The Graphite Lubricating Company BOUND BROOK, N. J.

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## A. F. JUDSON, E.M.

Geologist and Mining Engineer,

Mines Examined and Reported on.

COLTON, CALIFORNIA

## A. A. WARREN

ASSAYER AND ANALYTICAL CHEMIST

COLTON,

CALIFORNIA



## MINING STOCK QUOTATIONS

BOSTON	
Aetna Con.	3 38
Allouez	do. rights 55
Anacoda	4 75
Arnold	16 88
Ash Bed	3 88
Atlantic	28 00
Baltic	17 88
Bonanza	do. rights 75
Boston and C. C.	28 00
Boston & Mont'a 2111	55 25
Butte & Boston	24 75
Calumet & Hecla	575 00
Catalpa	118 1/4
Centennial	16 50
Dominion Coal	24 00
Dominion Pref.	109 3/4
Franklin	14 75
Gold Coin	1 00
Humboldt	4 75
Illinois Steel	60 00
Lake Sup Iron	—
Marquette	22 60
National	75
New Idria Mg.	—
Old Dominion	28 00
Osceola	55 25
Parrott	22 60
Pioneer	5 75
Quincy	118 1/4
San Yaeel	—
Tamarack	165 00
Tecumseh	2 60
Wolverine	23 00

## NEW YORK.

Alamo	03 1/2	Homestake	28 50
Alice	40	Iron Silver	—
Annetta	45	Mexican	30
Best & Belcher	60	Mollie Gibson	19
Brunswick	05	Ontario	4 50
Bulwer	65	Pharmacist	10
Crown Point	—	Plymouth	—
Con. Cal. & Va.	—	Quicksilver	3 00
Cripple Creek Con.	08 1/2	Quicksilver pfd.	11 00
Deadwood	11 25	Sierra Nevada	—
Favorite	04	Standard	1 60
Fortuna	45	Union Con.	—
Golden Fleece	45	Yellow Jacket	—
Gould & Curry	45	—	—
Hale & Norcross	—	—	—

## SAN FRANCISCO.

Alpha	10	Gould & Curry	14
Alta Con	10	Hale & Norcross	1 85
Andes	04	Justice	08
Belcher	23	Mexican	14
Best & Belcher	16	Occidental	52
Bodie	10	Ophir	26
Bullion	10	Potosi	20
Caledonia	52	Savage	12
Challenge	13	Sierra Nevada	67
Chollar	19	Silver Hill	10
Confidence	40	Union Con.	20
Con. Cal. & Va.	40	Utah	06
Crown Point	10	Yellow Jacket	19

## COLORADO SPRINGS STOCKS

Acacia	02 1/2	Isabella	23
Alamo	02 1/2	Jack Pot	07 1/2
American Con.	01 1/2	Little	88
Anacoda	37	Kimberly	02 1/2
Argentum Juniata	20 1/2	Magnet Rock	008
Banner	—	Matos	22 1/2
Bob Lee	001 1/2	Mineral Rock	—
Creede & C. C.	04	Mountain Beauty	01 1/2
Dante	01 1/2	Mollie Gibson	19 1/2
Des Moines	01 1/2	Moon Anchor	97
Elkton Con.	98 1/2	Mount Rosa	12
El Paso	003	New Haven	01 1/2
Emma Almee	007 1/2	Orion	008
Fanny R.	21	Orphan Bell	08
Favorite	02 1/2	Peoples	01
Findley	05 1/2	Pharmacist	03 1/2
Fl'wer of the W't	005	Pilgrim C.	02
Franklin	003	Portland	1 18
Golden Crater	—	Pr. Albert	5 1/2
Golden Fleece	22	Rattler	01 1/2
Gold & Globe	01 1/2	Specimen	03 1/2
Gold King	55	Theresa	06
Gould	03	Trachyte	02
Granite Hill	01	Union Gold	13 1/2
Hayden	004	Work	05 1/2
Ingham Con.	04 1/2	—	—

## SALT LAKE CITY

Alice	90	Malvern	—
Ajax	34	Manmoth	1 80
Alliance	—	Maxfield	—
Anchor	17 1/2	Mercur	7 27 1/2
Buckeye	02	Morgan	—
Bull Beck	6 20	Northern Light	10
Cent. Eureka	25 00	Omaha	28
Chloride Point	39 1/2	Ontario	4 10
Dalton	01	Overland	—
Daly	70	Richmond Anaconda	03 1/2
Daly West	4 20	Rover	—
Dalton & Lark	05	Sacramento	45
Dexter	1 20	Silver King	18 50
Eagle	03	Sioux Con.	—
Eureka Hill	—	Sioux Con.	—
Four Aces	04 1/2	Swansea	2 50
Galena	45	Swansea	1 20
Gemini	75 1/2	Swansea	1 20
Geyser-Marion	6 05	Utah	85
Grand Central	05	Utah Con.	—
Homestake	09	Utah Con.	—
Horn Silver	1 35	Valco	26
Little Pittsburg	02	Young America	57 1/2

## ROSSLAND, BRITISH COLUMBIA.

Alberta	05	Josie Mac	12 1/2
B. C. Gold King	07	Josie	38
Beaver	10	Jumbo	75
Big Three	10	Knight Templar	05
Bluebird	07	Kootenay	10 1/2
Bruce	10	Le Roi	8 00
Butte	01 1/2	Lilly May	18
Caledonia Con.	05 1/2	Label	15
California	15	Mayflower	10
Camp Bird	05	Monita	18
Celtic Queen	05	Monte Christo	19 1/2
Centre Star	—	Morning Star	08
Colonna	24	Mugwump	03
Commander	18	Nest Egg	05
Deer Park	12 1/2	Northern Belle	10
Della Colla	02	Novalty	09
Delaware	12	O. K.	10
Eastern Star	20	Palo Alto	05
Enterprise	15	Phantom	13 1/2
Eric	03 1/2	Pootman	15
Eureka Con.	05 1/2	R. E. Lee	15
Evening Star	08 1/2	Red Eagle	06
Georgia	10 1/2	Red Mount View	10
Gertrude	10 1/2	Red Point	10
Golden Drip	15	Road H'mest'ke	05
Good Hope	03 1/2	Roseland, Red Mt.	08
Grand Price	03 1/2	St. Elmo	20
Great Western	08	St. Paul	12 1/2
Hattie Brown	—	Silver Bell	04
Helen	04	Silverline	10
High Ore	04 1/2	So. Cross & W. Con	12
Imperial	10	Virginia	08
Iron Horse	20	War Eagle Con.	100
Iron Mask	38	West Le Roi	21
I. X. L.	10	White Bear	11

## DENVER STOCK REPORT.

Aetna	001	Keystone	04 1/2
Anchoria Leland	57	Lillie	89
Anacoda	37	Matos	22 1/2
Arcadia	01 1/2	Mollie Gibson	20
Argentum Juniata	20 1/2	Moon Anchor	97 1/2
Banner	—	Mt. Rosa	12
Bob Lee	01	Old Gold	—
Elkton	98 1/2	Peoples	01
El Paso G	07 1/2	Pilgrim C.	02
Enterprise	04 1/2	Pine Creek	003
Fanny R.	21	Portland	1 18
Garfield Grouse	—	Prince Albert	01 1/2
Geo. Washington	002	Republic	02 1/2
Golden Eagle	29	Sacramento	02 1/2
Gold Coin	96	Smuggler	24
Gilpin & C. C.	40	Specimen	03 1/2
Gilpin Four	004 1/2	Tamarack	007
Golden Fleece	22	Union Gold	13 1/2
Isabella	23	Virginia M	03 1/2

Iron Clad	02 1/2	Wheel of Fortune	002 1/2
Jack Pot	03 1/2	Work	02 1/2

## MEXICO

Name of Company	State	Price
Alianza	Hidalgo	5
Amistad y Concordia	"	24
Angustias	Guanajuato	390
Arevalo y Anexas	Hidalgo	240
Asturiana y Anexas	Zacatecas	170
Barradon y Cubras	Durango	100
Bartolome de Medina	Hidalgo	30
Cabezon y An	Zacatecas	30
Candelaria de Pinos	"	180
Capuzaya	Durango	120
Carmen	Hidalgo	400
Castellana y San Ram	Topic	25
Cerro Colorado	Chihuahua	10
Cinco Senores y An	Guanajuato	480
Concepcion y Anexas	S. Luis Potosi	100
El Oro	Guanajuato	40
Espananza y An	Mexico	1,300
Guadalupe	Guanajuato	40
Huastla	Santa Ana	100
Luz de Borda	Michoacan	40
Luz de Maravillas	Hidalgo	100
Pabellon	"	150
Palma	Zacatecas	100
Porfirismo de los Com	"	5
Real del Monte	Hidalgo	900
Refugio y Va	"	8
Restauradora	Durango	80
San Francisco	Hidalgo	270
S. Fed. Chalcchihuites	"	12
San Rafael y Anexas	"	925
do. Free Stock	"	400
San Rafael del Oro	Hidalgo	20
Ste. Maria de la Paz	S. Luis Potosi	850
Sierra	Durango	50
Soledad	Hidalgo	500
Sorpesa	"	250
Trinidad	Guanajuato	40
Tiauzingo	Puebla	27
Union	Hidalgo	280
Zomelahuacan (gold)	Vera Cruz	100
Zona Min. de Pozos	Guanajuato	15

NOTE—The above Mexican stocks are figured on the basis of Mexican silver

## ORE TESTING

Complete mill for testing ores on practical scale by all processes to determine the best process adapted to treating any ore submitted. Processes in use investigated to overcome unnecessary losses, etc.

## RICKETTS &amp; BANKS,

Metallurgists &amp; Chemists

No. 104 JOHN STREET,

NEW YORK CITY

## Krogh Manufacturing Company

Successor to San Francisco Tool Co.'s Machine &amp; P'g Dept.

MANUFACTURERS OF AND DEALERS IN

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COMPRISING

Briggs' 2-Stamp Triple-Discharge Quartz Mill, of Latest improved pattern, Rock Breakers, Ore Feeders, Concentrators, Engines and Boilers, Hoisting Rigs to be operated by Horse, Steam Power or any other motor; Ore Cars and Ore Buckets, Cornish and Jackhead Pumps, Triple-Acting Pumps, Centrifugal Sand and Gravel Pumps, Wooden Tanks and Pumps for the Cyanide Process, Pipe and Gate Valves, Link Chain Elevators for elevating and conveying all kinds of material. Estimates as to cost of machinery and its erection furnished upon application. Write for Catalogue and Prices.

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51 Beale St. and 9 to 17 Stevenson St.,

San Francisco, Cal.

## ASSAY OFFICE

## Lew. E. Aubury, E. M.

Cyanide Plants erected and operated. Practical Working Tests made. Mines Examined and Purchased.

115 W. First St.,

Opp. Nat'k House

Los Angeles, Cal.



The Southern California Lumber Co., Stimson Bk., Los Angeles, Cal., Chas. Wier Manager, sells

## LUMBER

At Wholesale Prices

Mining Timbers a Specialty

Write for Price

## FROM CRIPPLE CREEK

AIR COMPRESSORS,  
ROCK DRILLS,  
Stone Channelers,  
The Pohle Air Lift Pump,  
Coal Cutters,

The Ingersoll-Sergeant Drill Co., HAVEMEYER BUILD'G.  
NEW YORK.

JAMES F. BURNS, Pres't JOHN HARNAN, Gen. Man.

FRANK O. BECK, Sec'y and Treas.

## THE PORTLAND GOLD MINING CO.,

(Stock Transfer Office, Colorado Springs.)

Mines at Victor, Colorado.

COLORADO SPRINGS, COLO., May 19, 1898.

## The Ingersoll-Sergeant Drill Co.,

Gentlemen:—We bought two years ago one of the largest size of the straight line type of Ingersoll-Sergeant Piston Inlet Compressor.

This was found to be too small for our needs about a year ago and we purchased of you a Duplex Corliss machine 16" x 18" x 42".

This was set in place in our shaft house in the Cripple Creek District, 10,000 feet above the level of the sea, and has been running continuously ever since, and at times over ten 3/4" Eclipse drills. The steam cylinders were connected to an independent jet condenser, for which we are using the mine water, and the resultant economy of operation is very noticeable.

The operation of this Compressor is as near perfect as that of any machine we have ever seen, and this type is well worth the extra cost on account of the great permanent economy in operation.

Our mine is equipped exclusively with your drills and we have only the highest words of praise to give them.

Yours very truly, The Portland Gold Mining Co.,

Jas. A. Burns, President



## INCORPORATED MINES PAYING DIVIDENDS.

	NAMES OF MINES	LOCATION	No. of Shares	Capital Stock	Par Value	Amount of last Dividend	Date of Last Dividend	Total Amount Paid in Dividends	Kind of Mineral Produced
1	Aetna Cons.	California	100,000	\$ 500,000	\$ 5	\$ 10	July 1898	\$ 140,000	Q.
2	Alaska, Treadwell	Alaska	200,000	5,000,000	25	37½	April 1898	3,475,000	G.
3	Alaska Mexican	Alaska	200,000	1,000,000	5	10	April 1898	297,031	G.
4	Alice	Montana	400,000	10,000,000	25	05	April 1898	1,075,000	G. S.
5	Alice	Utah	400,000	10,000,000	25	05	April 1898	1,075,000	S. L. G.
6	Anaconda	Montana	1,200,000	30,000,000	25	1 25	May 1898	6,750,000	C.
7	Anchoria Leland	Colorado	600,000	600,000	1	01	July 1898	144,000	G.
8	American Gold	Colorado	300,000	3,000,000	10	02	Mar 1898	291,000	G. S. L.
9	Atlantic	Michigan	40,000	1,000,000	25	1 00	Feb. 1898	780,000	S.
10	Bald Butte	Montana	250,000	250,000	1	03	Sept 1897	512,500	G. C. S.
11	Bangkok C-Bell	Colorado	600,000	600,000	1	01	July 1896	107,510	S. L. C.
12	Big Six	Colorado	500,000	500,000	1	00½	May 1898	15,000	G. S.
13	Boston & Montana	Montana	150,000	3,750,000	25	3 00	May 1898	7,625,000	G. C. S.
14	Bullion Beck and Champion	Utah	100,000	1,000,000	10	50	Mar 1897	2,485,000	G. S.
15	Bunker Hill and Sullivan	Idaho	300,000	3,000,000	10	05	July 1898	495,000	S. L.
16	Cariboo	British Col.	800,000	800,000	1	02	May 1898	204,965	G.
17	Calumet & Hecla	Michigan	10,000	2,500,000	25	10 00	June 1898	58,850,000	C.
18	Centennial Eureka	Utah	30,000	1,500,000	50	1 00	Mar 1897	2,010,000	S. L.
19	Central Lead	Missouri	4,000	400,000	100	1 00	Apr 1898	40,000	L.
20	Charleston	South Car	10,000	1,000,000	100	1 00	Feb 1897	150,000	.....
21	Champion	California	34,000	340,000	10	25	April 1898	298,200	G.
22	Chloride Point	Utah	500,000	500,000	1	01	Dec. 1897	5,000	G. S.
23	Colorado Sun	Montana	100,000	1,000,000	10	50	June 1898	1,595,000	G. S. C.
24	Crescent	Utah	24,000	600,000	25	.....	July 1897	280,000	.....
25	Crowned King	Arizona	600,000	6,000,000	10	02	June 1893	160,000	G. S. L.
26	Daly	Utah	150,000	3,000,000	20	25	Mar 1897	2,925,000	S. L.
27	Deadwood Terra	S. Dakota	200,000	5,000,000	25	05	May 1898	1,350,000	G.
28	De Lamar	Idaho	400,000	2,000,000	5	29	May 1898	2,451,600	S. L.
29	Elkton Consolidated	Colorado	1,250,000	1,250,000	1	01½	July 1898	555,710	G. S.
30	El Paso	Colorado	650,000	650,000	1	01	Jan 1894	12,093	G. S.
31	Empire State	Idaho	75,000	750,000	10	10	June 1898	7,500	.....
32	Fern	British Col.	200,000	200,000	1	05	Jan 1898	10,000	.....
33	Florence	Montana	500,000	2,500,000	5	01	May 1897	132,530	S.
34	Geyser-Marion	Utah	300,000	1,500,000	5	02	May 1898	84,000	G.
35	Gold Coin of Victor	Colorado	1,000,000	1,000,000	1	01	June 1898	80,000	G.
36	Golden Cycle	Colorado	20,000	1,000,000	5	00½	June 1898	150,000	.....
37	Gold Coin	Colorado	200,000	1,000,000	5	05	Nov 1897	160,000	G. S.
38	Gold and Globe	Colorado	750,000	750,000	1	3-10	July 1897	51,625	G.
39	Golden Reward	S. Dakota	.....	1,000,000	15	.....	Feb 1893	155,000	G.
40	Hecla Consolidated	Montana	30,000	1,500,000	50	50	Feb 1897	2,175,000	S. G. L. C.
41	Helena & Frisco	Idaho	500,000	2,500,000	5	04	August 1896	475,000	S. L.
42	Highland	S. Dakota	100,000	10,000,000	100	20	June 1898	3,664,718	G.
43	Holy Terror	S. Dakota	300,000	300,000	1	03	July 1898	99,000	G.
44	Homestake	S. Dakota	125,000	12,500,000	100	50	June 1898	6,806,250	G.
45	Hope	Montana	100,000	1,000,000	10	10	Mar 1898	762,252	S.
46	Horn Silver	Utah	400,000	10,000,000	25	05	April 1898	5,120,000	S. L.
47	Idaho	British Col.	500,000	500,000	1	05	May 1898	264,000	.....
48	Iowa	Colorado	1,000,000	1,000,000	1	00½	June 1898	90,000	G.
49	Iron Mountain	Montana	500,000	5,000,000	10	1 00	Jan 1898	501,100	S.
50	Isabella	Colorado	2,250,000	2,250,000	1	00½	June 1897	270,000	G.
51	Kearsarge	Michigan	40,000	1,000,000	25	10	Aug 1897	160,000	C.
52	Last Chance	British Col.	500,000	500,000	1	04	Jan 1897	42,000	S. L.
53	Le Roi	British Col.	500,000	2,500,000	5	10	Apr 1898	775,000	G.
54	Lillie	Colorado	1,000,000	1,000,000	1	01	July 1898	99,100	G.
55	Minnesota	Minnesota	165,000	16,500,000	100	1 50	July 1898	3,735,000	L.
56	Montana Ltd	Montana	660,000	3,300,000	5	05½	May 1898	2,997,557	G. S.
57	Montana Ore Purchasing	Montana	40,000	1,000,000	25	1 00	July 1898	760,000	.....
58	Morning Star	California	2,400	240,000	100	5 00	June 1898	666,600	G.
59	Mt. Rosa	Colorado	1,000,000	1,000,000	1	02	Jan 1898	60,000	G.
60	Mercur	Utah	200,000	5,000,000	25	13	May 1898	1,066,000	G.
61	Mammoth	Utah	400,000	10,000,000	25	05	June 1898	1,250,000	G. S. C. L.
62	Moon Anchor Gold	Colorado	600,000	600,000	1	07½	July 1898	216,000	G.
63	New Elkhorn	Colorado	300,000	1,500,000	5	24	Sep. 1896	72,000	G.
64	New York & Hon. Rosario	Central A.	150,000	1,500,000	10	10	July 1898	930,000	S. G.
65	Napa	California	100,000	700,000	7	20	July 1898	930,000	Q.
66	New Idria Quicksilver	California	100,000	500,000	5	10	July 1898	60,000	Q.
67	Ontario	Utah	150,000	15,000,000	100	75	Dec. 1897	13,542,500	S. L.
68	Osceola	Michigan	50,000	1,250,000	25	1 00	June 1898	2,272,500	C.
69	Parrot	Montana	230,000	2,300,000	10	30	July 1898	2,000,898	C.
70	Pennsylvania Consolidated	California	51,500	5,150,000	10	05	June 1898	38,775	.....
71	Portland	Colorado	3,000,000	3,000,000	1	01½	June 1898	1,492,898	G. S.
72	Princess	Colorado	1,000,000	1,000,000	1	00½	Feb 1897	45,000	G.
73	Quincy	Idaho	100,000	2,500,000	25	3 00	Feb. 1898	9,370,000	C.
74	Rambler-Cariboo	British Col.	1,000,000	1,000,000	1	02	April 1897	40,000	.....
75	Raven	Colorado	1,500,000	1,500,000	1	01	March 1898	20,000	G.
76	Reco	British Col.	1,000,000	1,000,000	1	10	Jan 1898	287,500	S. L.
77	Sacramento	Utah	1,000,000	5,000,000	5	00½	June 1898	35,000	G.
78	Santa Rosalia	California	100,000	100,000	1	10	Feb. 1898	125,000	G. S.
79	Small Hopes Consolidated	Colorado	250,000	5,000,000	20	10	June 1898	3,300,000	S.
80	South Swansea	Utah	150,000	150,000	1	05	April 1898	90,000	S. L.
81	Standard	California	200,000	20,000,000	100	10	Mar 1898	5,654,940	G. S.
82	St. Joseph	Missouri	250,000	2,500,000	10	15	Oct 1897	24,000	L.
83	Silver King	Utah	150,000	3,000,000	20	25	June 1898	1,575,000	S. L. G.
84	Slocan Star	British Col.	2,000,000	1,000,000	0.50	05	Mar 1897	350,000	.....
85	Smuggler	Colorado	1,000,000	1,000,000	1	01	June 1898	1,035,000	S. L. Z.
86	Smuggler Union	Colorado	50,000	5,000,000	100	1 00	Oct 1896	150,000	G. S.
87	Swansea	Utah	100,000	500,000	5	05	June 1898	100,000	S. L.
88	Tom Boy	Colorado	200,000	2,000,000	10	10	Dec 1896	600,000	G.
89	Tamarack	Michigan	60,000	1,500,000	15	3 00	June 1898	5,330,000	C.
90	Union	Colorado	1,250,000	1,250,000	1	01	June 1896	73,000	S.
91	Utah	Utah	100,000	1,000,000	20	01	Dec. 1897	177,000	G. S.
92	Utah Consolidated	Utah	30,000	150,000	5	02	Sept. 1896	3,000	S. L.
93	Victor	Colorado	200,000	1,000,000	5	50	June 1898	955,000	G.
94	Vindicator	Colorado	1,500,000	1,500,000	1	05	July 1898	76,125	G.
95	Western Mine Enterprise	Montana	500,000	500,000	1	20	Jan 1898	48,680	.....
96	War Eagle	British Col.	500,000	500,000	1	01½	July 1898	264,750	.....
97	White Water	British Col.	125,000	625,000	5	32	April 1898	194,000	.....

S, Silver.

G, Gold.

L, Lead.

C, Copper.

Q, Quicksilver.

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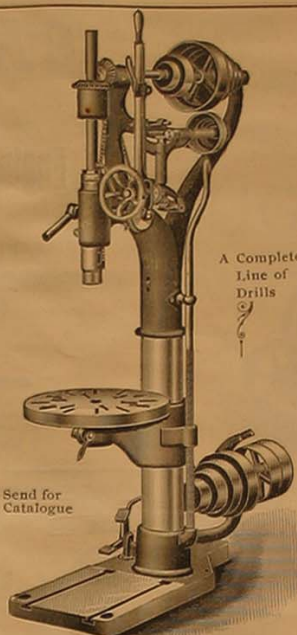
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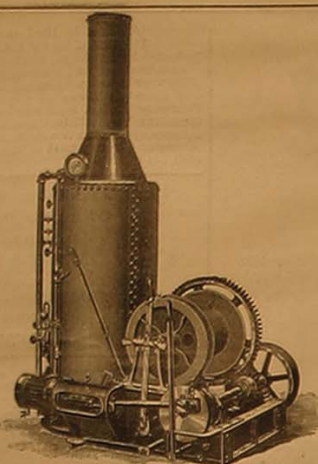
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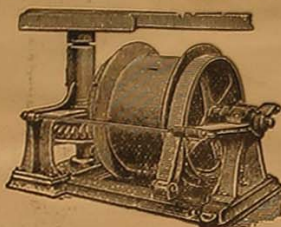
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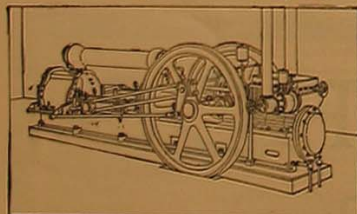
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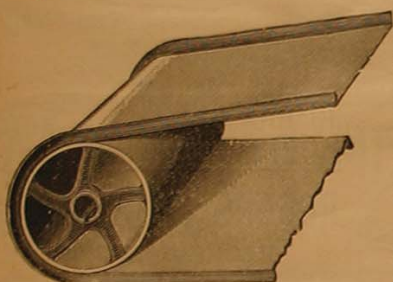
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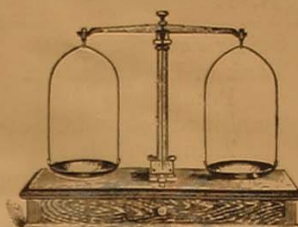
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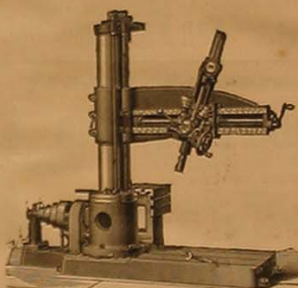
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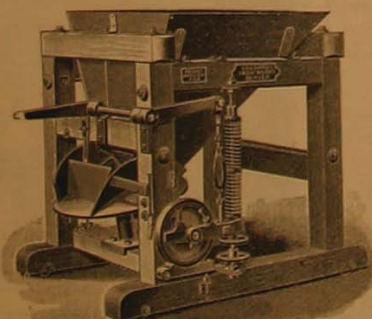
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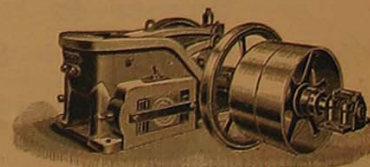
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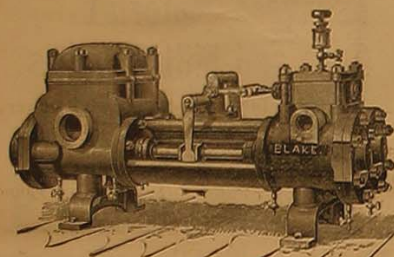
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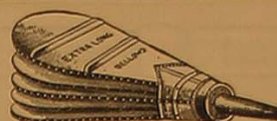
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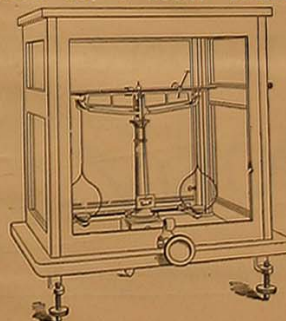
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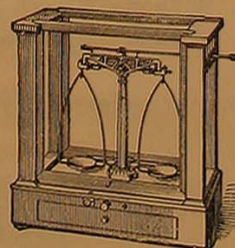
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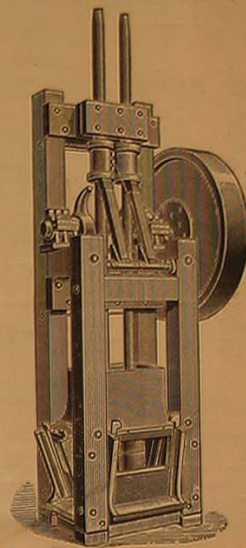
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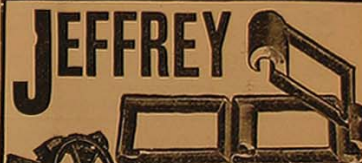
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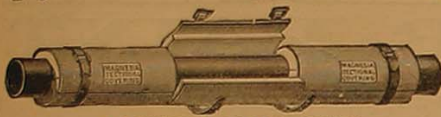
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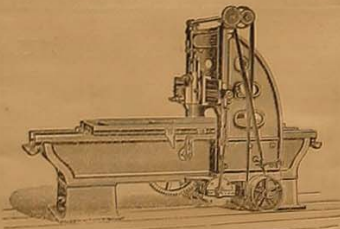
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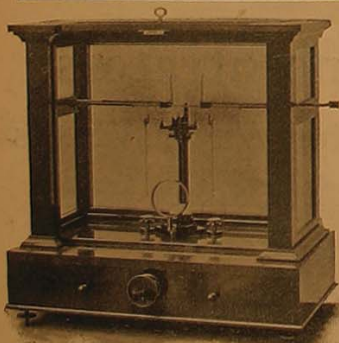
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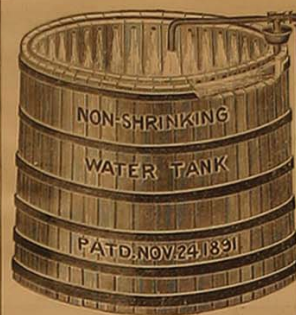
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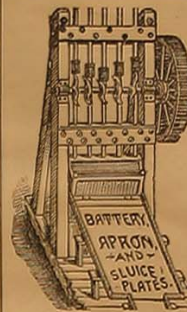
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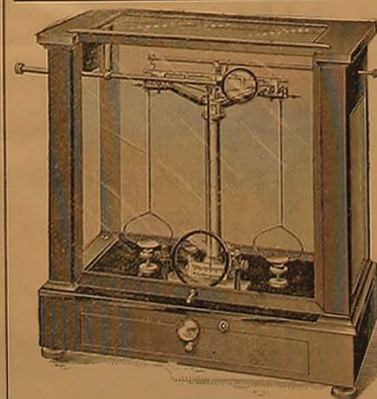
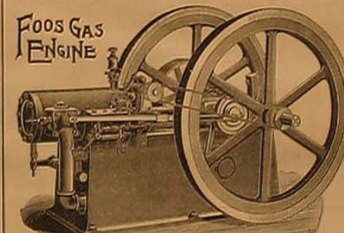
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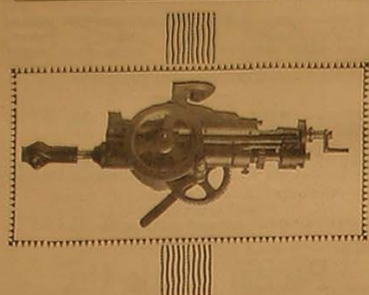
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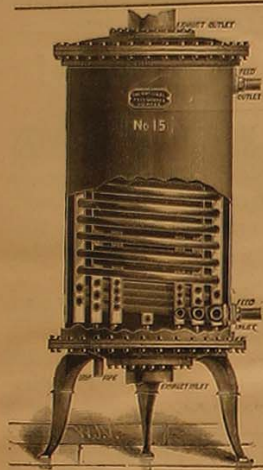
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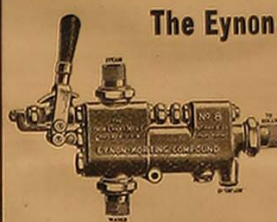
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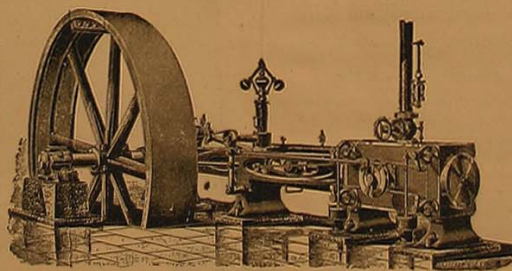
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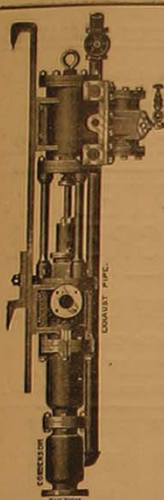
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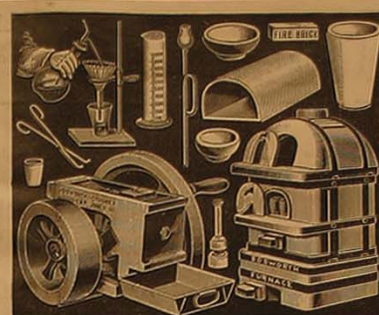
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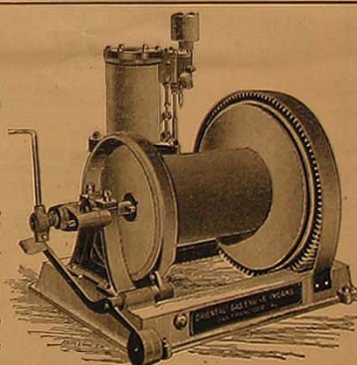
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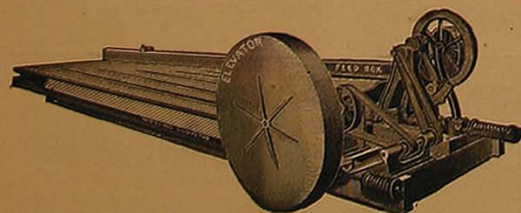
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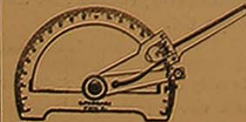
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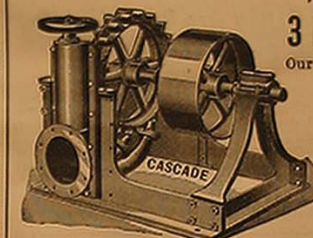
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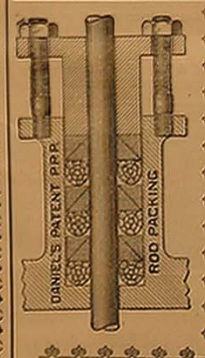
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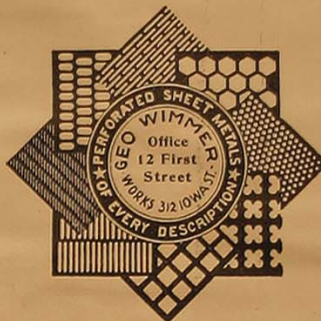
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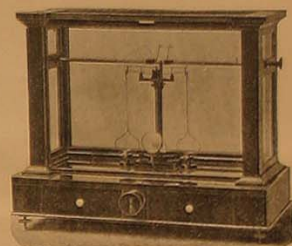
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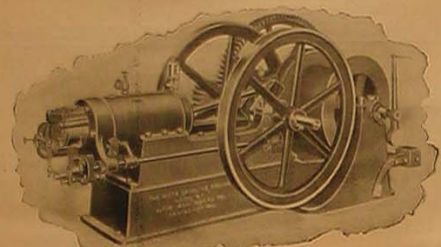
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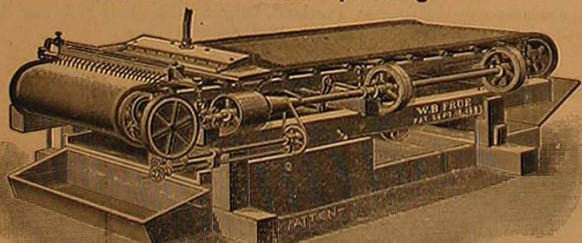
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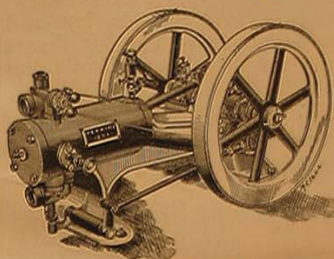
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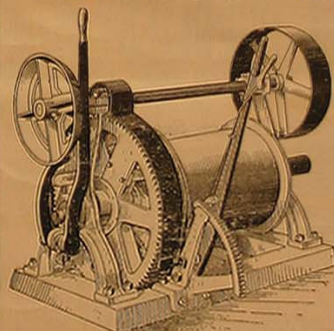
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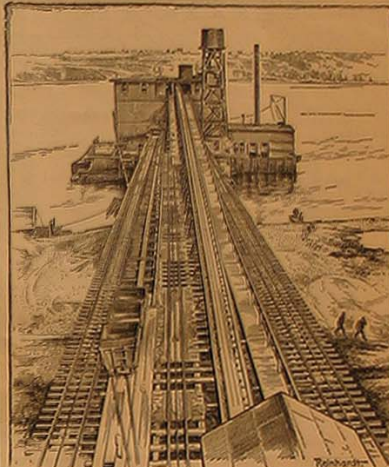
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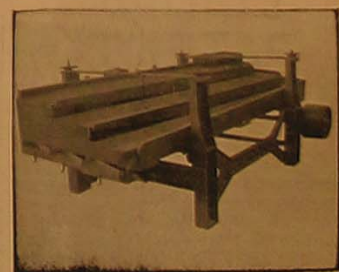
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